

ONE TO ONE

THE INTERNATIONAL MAGAZINE FOR MASTERING, PRESSING & DUPLICATING

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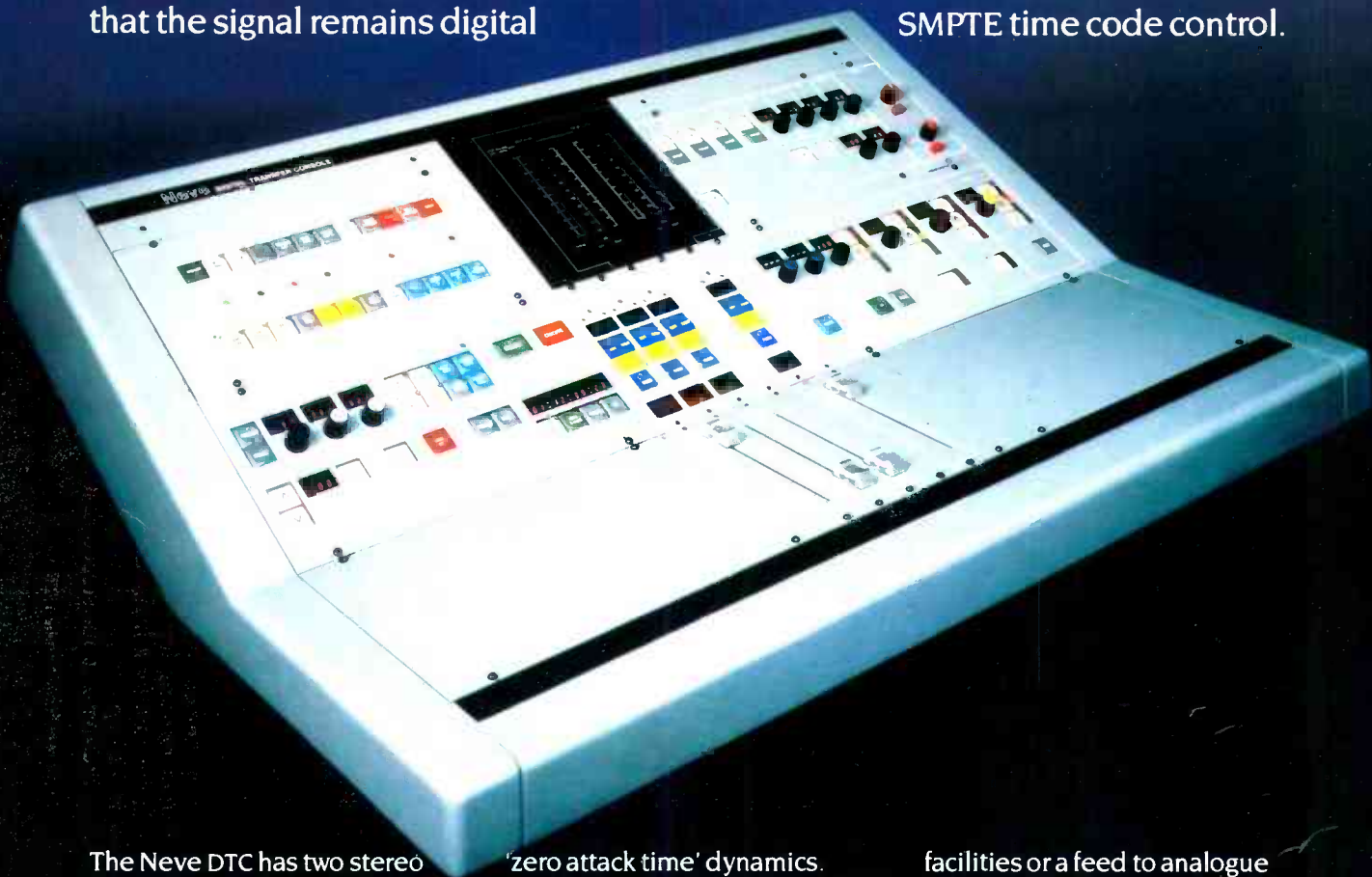
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THE INTERNATIONAL MAGAZINE FOR MASTERING, PRESSING & DUPLICATING

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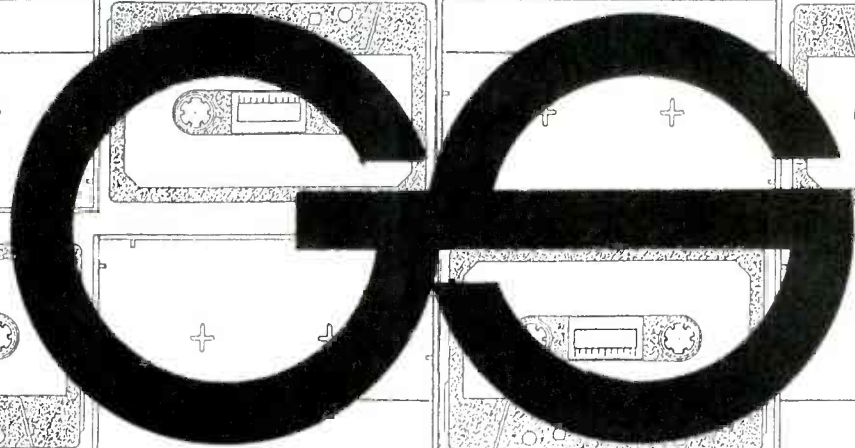
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Sitting on the fence

In last month's Editorial I spoke about the need to examine the future of CD and DAT in a quite different light from the traditional view we have of conventional records and tapes. One very large question I didn't discuss in my speculative view of the future, was where this leaves the musicassette in the scheme of things.

Whilst it may be fair to say that the CD manufacturers are generally looking forward to a bright future — despite the odd hiccup — and the vinyl LP continues to surprise people with its dogged resistance to lie down and play dead, the musicassette remains something of an enigma.

On the surface the musicassette has everything going for it at the moment — ie top selling format, increasing sales, improved quality, large consumer hardware base. So what is it that is causing some concern here and there? The answer is not easy to pin point as it doesn't appear to be just a straightforward case of cause and effect, but more the inter-relation of a whole number of factors.

For an industry to feel buoyant and positive it's essential that there is some basic stability in the market and the way forward is clearly charted. In these respects the duplication industry appears to be at some kind of crossroads, at least as far as long term plans are concerned. The reasons for this are obvious: although the market appears to be stable, at least superficially, there's an element of 'living on borrowed time' in the equation and the way ahead is anything but clear. After knowing the basic ground rules for years times are changing sometimes in unexpected ways.

The world is shrinking, at least as far as sales and marketing are concerned. Already duplication equipment manufacturers have realised that they have to look further afield for new sales and indeed the irony of the situation is that final battle for commercial success may be won (or lost) in some far off corner of the globe, thousands of miles from home.

This of course is nothing new as far as the Japanese are concerned. They haven't become the richest nation on earth by just satisfying the home market and no doubt there are valuable lessons to be learned from their technique.

Failure to market effectively in the world marketplace leaves the door wide open for someone else who is prepared to be aggressive. Ten or fifteen years ago perhaps this wasn't so important but today all domestic markets are potentially someone else's export target and new technology travels far and wide in search of customers.

If these problems are already starting to affect the equipment manufacturers then it may not be too long before the duplicators are facing a similar situation. Investment in new technology is certainly a major part of the problem. It is essential to invest in new equipment. The duplication industry won't survive if it isn't efficient. Old, inefficient equipment held together with rubber bands is definitely not the way to survive in the 1990s. But the problems don't just stop there.

For many the dilemma is not whether to buy or not but *what* they should buy. It's not an easy question to answer and what is right for one particular area or market may not be right for another. There are some dramatic changes in the pipeline, some of which have never

happened before. That puts more or less everyone on the same starting line. For example there are big changes planned for Europe in 1992. The removal of trade barriers between member countries means easier passage of goods and the opening of the Channel tunnel between the UK and mainland Europe makes the economic possibility of larger duplicating plants from central distribution points a touch more possible. This centralising of European manufacturing is already taking place with the closure of vinyl pressing plants. Due to the nature of the technology it was almost a prerequisite as far as CD was concerned. One wonders how long it might be before someone starts to apply the same logic to the duplication of cassettes. In your projected plans for the first half of the 1990s (you have projects I presume?), how might this affect you?

Almost everyone I speak to wants to know where things stand regarding DAT. Some sectors of the industry are clearly not impressed, others are ready and waiting to go with the format, some have already made the first commitment and the majority appear to be in a 'wait and see' situation.

If the hardware manufacturers expect the duplicators to support the DAT format and be ready and waiting when the 'Go' button is pressed, then at least some kind of positive support should be forthcoming. There's no doubt that DAT is a natural, high tech product for the 1990s but there seems to be a growing frustration that time is ticking by. It's worrying too — although one can hardly blame them — that a number of tape manufacturers have diverted some of their R&D resources into optical recording discs: in other words the recordable CD.

Why aren't we getting cheaper metal tape and Type IV tape duplicating systems? Presumably no one expects any breathtaking improvements beyond chrome and Dolby *Hx Pro* — at least not in the field of musicassettes. For the traditional duplicator the good news is that the millions of Walkmans, in-car players and home cassette decks won't all be thrown away overnight.

As far as DAT is concerned it looks increasingly like you will either have to make a massive investment in the format with high speed equipment and be determined to be an international or at least national supplier or take the 'corner shop' approach and service a small local area with a personal realtime service. Its hard to see what lies in between for the medium size company particularly when the video duplicators, prepared to invest in the *T-700* or the *Sprinter* have more than a passing interest in maximising their capital investment in whatever formats provide a profitable return. Although there may well be some space in the middle ground for the middle size company I'd be inclined to do my homework very, very carefully. For some it may prove more profitable to be big in analogue for 10 years than struggling with DAT for 20.

There are many changes taking place and naturally people are cautious. If I were 'sitting on the fence' I'd get off quick, make sure I knew exactly where I wanted to be in 1993 with regard to DAT or analogue, buy the very best equipment I could lay my hands on and start promoting like crazy either DAT *or* analogue cassettes.

In 1993 there may not be a choice.

Carl A Snape

DAT potential

With the rejection of the Copycode proposal presented to Congress, DAT players may soon make their move on the US market. Although the road will be bumpy, potential DAT hardware vendors must feel that there will be few problems in light of the barrier alliance that Sony has made with Hewlett-Packard. Sony has also announced standards for DAT computer storage devices.

Venture Development Corporation (VDC), One Apple Hill, Natick, MA 01760, USA. Tel: (617) 653-9000, has released a study that analyses the impact of all the recent developments in the DAT area. VDC projects that the first home DAT players will be introduced to retailer shelves and into the dashboards of Lincoln automobiles in the third quarter of 1988. There are expected to be sales of about 12,500 consumer audio DAT players in 1988, increasing at an average annual rate of 222% to over 1.3 million by 1992.

In the early years, the majority of units will be aimed at the home DAT user. The portable DAT player, like the boom box for standard cassettes, will grow slowly due to its relatively high price tag. Substantial car use is not expected until well into the early 1990s. According to the report DAT has three advantages for the car environment over CD players: DAT players are more resistant to road vibration; users can make their own tapes, instead of CDs which are prerecorded; and the cassettes are very small and take up less space in the car.

The disadvantages of DAT relative to CD players for the car are: heat from the engine may destroy the tape surface and the machine may 'eat' tapes when the temperature rises too high.

Retailers expect that the first DAT players introduced will be expensive and therefore appealing only to true audiophiles. End user prices for a home DAT player should be between \$1,000 and \$2,000.

DAT offers much more promise in terms of revenue as a computer storage peripheral. DAT has significant product advantages over current streamer tape backup systems. The major one being storage of a gigabyte of information on a cassette the size of a thick business card. VDC's study, *The Emerging US Market for DAT Players for Consumer Audio and Computer Applications* projects that in 1988 about 10,000 DAT storage devices will be sold for use with personal computer systems in the US WORM disk drives and traditional streamer tape systems will feel the most heat from the new media. During the late 1980s and into the 1990s shipments will increase at over 165% annually.

Sony and Hewlett-Packard are taking great pains to make sure that DAT is introduced smoothly to the computer peripheral market, so as not to further alienate buyers who are confused by the delay in the consumer arena. Standards for recording data have been set

and the companies will be presenting a united front to potential licencees. The key to success will be getting Apple and IBM to bless the standards early and consistently. This is less of a concern for Apple than for IBM.

Celebrity LP recorder

A video recorder designed for the creation of high-quality masters to be used in high-speed duplication of LP video product has been introduced by the Celebrity Research and Development Group. Sample prerecorded videocassettes were presented in a demonstration by the company, in conjunction with Celebrity Duplication Services, at the International Tape/Disc Association's (ITA) 18th Annual Seminar.

The CRDG recorder uses the same high-coercivity metal type 1/2 inch tape as used to create standard speed recordings on the *Sprinter* system. It also offers Dolby encoded stereo recording on its linear audio track. The LP high speed printer offers a 50% reduction in mastering and duplicating tape costs and an almost two-fold increase in units printed per hour according to CRDG president Michael Sterling. With the technology, a 90-minute tape can be printed in just under 22 seconds, as compared to a printing time of 50 seconds for SP mode recorded tapes.

"By combining the established technology of the Sony *Sprinter* with the innovations of the Celebrity Research and Development team, we have developed a dramatically superior LP duplicating system which we feel will be of tremendous value, financially and technologically to the home video market," said Sterling.

To date, the most prevalent method in use by duplicators seeking to provide a client with LP recorded tapes is to utilize inexpensive consumer machines. With this method, one video and audio signal is distributed to a large number of units. Because the consumer machines were designed to record LP and SLP (six hour play mode) for the purpose of playing it back using the same VCR on which it was recorded the precision of the tape path within the VCR often is not designed to provide the necessary mechanical stability that can allow for interchangeability among other VCRs.

An alternative method is to use professional LP duplicators, such as Panasonic's AG-6550/6551 duplication recorder, which provides a highly precise tape travel system and a more rugged and precise design. This system is designed to survive many hours of head-to-tape wear without mechanical breakdown and can offer a much better interchangeability factor from VCR to VCR than the former method. The recorder was designed to record at three different speeds, using a head that provides good performance for all three modes.

Celebrity Research and Development

Group, Canoga Park, CA, in response to a request by Celebrity Duplicating Services, developed the recorder in order to create high-quality LP mode masters that can be used on the *Sprinter*. While Sony provided a recorder to create the masters used by *Sprinter* to print standard speed videotapes, it does not make a unit designed to record in LP mode.

In preliminary field tests of the LP product, the interchangeability factor remained excellent tape after tape while realtime recorded product that was tested varied dramatically depending on the particular recorder used in production of the tape, according to Sterling.

Because many older consumer VCRs cannot play back the slower SLP speed, CRDG chose the LP recording speed. SLP does, however, allow for the use of Hi-Fi tracks, while LP recordings only use the linear tracks of the tape for audio. The company noted that while LP recording quality still must be viewed as a cost savings alternative to the higher quality standard speed recordings, the CRDG recorder provides the most stable, reliable, and highest quality methods to date of producing this lower priced product.

The ITA demonstration featured product duplicated on TDK copy tape and Sony mastering tape. "We've gotten a fantastic response here," said Celebrity Duplication Services president Robert Miller. "People really want to keep the price down, but what they're hurting for is quality. If you compare this method to other 1/2 speed methods, the quality is much higher. The biggest thing we have to do now is educate people about 1/2 speed."

Greencorp success

A 60% sales increase in the US market in the past year has been announced by Greencorp Inc, the Australian based tape manufacturer. Continuing its push into the US market, the company has introduced a new formulation, the XD-383 super gamma ferric tape, as well as supplying its current line of blank pancake and loaded audio tapes.

According to Jack Field, director of Greencorp, Hollywood, FL, the company is aiming at the independent duplicator supplied loaded blank tape. Currently selling in the high speed markets of more than 20 countries, the company has seen a worldwide sales increase of 7 or 8%.

"In the in-cassette market we've probably got about 2,000 customers nationwide," said Field.

Greencorp's users include the international divisions of CBS, EMI, Philips, and RCA, and this year will mark a major market thrust into the US. All Greencorp products are manufactured in Australia.

In addition, Greencorp is marketing genuine chrome tape, according to Field, and may introduce a videotape line in Australia later in the year.

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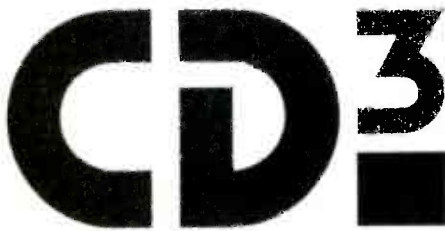
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US REPORT

RIAA endorse CD³

The RIAA marketing committee in the US have now officially endorsed the three inch CD and its new official logo.

Two sizes of packaging have been approved by the RIAA: External packaging dimensions for CD³ singles (two tracks) are to be 3x7 inch and for CD³ maxi's (more than two cuts or extended plays) will be 3x12 inch.



SOCS CVD-ROM

SOCS Research, Los Gatos, CA, has introduced Compact Video Disc technology designed to provide TV quality video on 12 cm CDs. The company demonstrated the technology, which includes CVD-ROM that will interface to a personal computer and provide full motion video, at the ITA Seminar, Tuscon, AZ.

CVD offers 18 minutes of continuous play NTSC video and digital stereo audio, or up to 18,000 still frames with less than one second access time, or 10 minutes of video with complete interactivity, according to Lowell Noble of SOCS, 15951 Los Gatos Blvd, Los Gatos, CA 95032. The video is accompanied

by two-channel, CD quality digital audio, and full LaserVision special effects are possible on the interactive discs.

The CD-ROM drive will install in a standard 5.25 inch floppy disc drive. A second generation CVD-ROM drive will be half height.

Sony office

Sony Magnetic Products Company has established a Southwest regional sales office in Irving, TX. The new facility will be headed by regional sales manager Richard Chambers.

Chambers joined Sony in 1984 as district sales manager, pro tape division, responsible for three Southwestern states. As regional sales manager he will be responsible for the sale of all professional tape products in nine Southwestern states.

Sony Pro Tape Division's other regional offices include: Itasca, IL, in the Midwest region; Cypress, CA, in the Western region; Norcross, GA, in the Southeastern region; and Paramus, NJ, in the Eastern region.

"We established this fifth region to better serve the needs of our professional tape customer," said John Bermingham, senior vice president, sales and marketing, Sony Magnetic Products Company.

Panasonic price increase

Panasonic has announced that, effective June 1, there will be an overall 15% price increase to its dealers on its line of blank videotape products. George Dzan, assistant general manager of PIC Magnetic Media Division, attributed the price restructuring to the

decline of the US dollar. Despite the price increase to dealers, he expects sales to continue to be positive in the marketplace.

"Our major dealers have told us market conditions have eroded their profit margins, and the price increase will help restore profits," Dzan said. "Our dealers say that slightly higher retail prices will have little effect on overall sales."

PIC's Magnetic Media Division plans to offer no rebates after July on its comprehensive line of blank video tape.

US trade figures: '73-'87

The dollar volume of US manufacturers' net shipments of prerecorded discs and tapes increased 20% in 1987. Unit shipments rose 14.3% to the highest level since 1987.

Shipments in 1987 were valued at \$5.57 billion, calculated at suggested list price, according to the Recording Industry Association of America (RIAA). This compares to a dollar value of \$4.65 billion in 1986. Unit shipments rose from 618.3 million in 1986 to 706.8 in 1987.

The total number of units shipped in 1987 (706.8 million) fell just short of the all-time high of 726 million achieved in 1978. Compact discs continued to show dramatic growth — unit shipments rose 93% over 1986. Cassettes also showed an impressive gain — unit shipments rose 93% over 1986.

Cassette singles made a healthy debut in 1987. There were 5.1 million units shipped at a dollar value of \$14.3 million. Disc singles were down but not as dramatically as in 1986. LPs/EPs continued to decline but at a slower pace than in previous years. Units were down by 15% — to 106.6 million units shipped in 1987.

US MANUFACTURERS' UNIT SHIPMENT:

(millions, net after returns)

	'73	'74	'75	'76	'77	'78	'79	'80	'81	'82	'83	'84	'85	'86	'87	% change '78-'86
SINGLES	228.0	204.0	164.0	190.0	190.0	190.0	195.5	164.3	154.7	137.2	124.8	131.5	120.7	93.9	82.0	-13
LPs/EPs	280.0	276.0	257.0	273.0	344.0	341.3	318.3	322.8	295.2	243.9	209.6	204.6	167.0	125.2	107.0	-15
CDs	—	—	—	—	—	—	—	—	—	—	0.8	5.8	22.6	53.0	102.1	+93
CASSETTES	15.0	15.3	16.2	21.8	36.9	61.3	82.8	110.2	137.0	182.3	236.8	332.0	339.1	344.5	410.0	+19
CASSETTE SINGLES	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5.1	N/A
TOTAL	614.0	592.0	531.8	590.9	698.2	726.2	701.1	683.7	635.4	577.7	578.0	679.8	653.0	618.3	706.8	+14.3

US MANUFACTURERS' DOLLAR VALUE:

(\$ millions, suggested list price)

	'73	'74	'75	'76	'77	'78	'79	'80	'81	'82	'83	'84	'85	'86	'87	% change '78-'86
SINGLES	190.0	194.0	211.5	245.1	245.1	260.3	275.4	269.3	256.4	283.0	269.3	298.7	281.0	228.1	203.3	-11
LPs/EPs	1,246.0	1,356.0	1,485.0	1,663.0	2,195.1	2,473.3	2,136.0	2,290.3	2,341.7	1,925.1	1,689.0	1,548.8	1,280.5	983.0	793.1	-19
CDs	—	—	—	—	—	—	—	—	—	—	17.2	103.3	389.5	930.1	1,593.6	+71.3
CASSETTES	76.0	87.2	98.8	145.7	249.6	449.8	604.6	776.4	1,062.8	1,384.5	1,810.9	2,383.9	2,411.5	2,499.5	2,959.7	+18.4
CASSETTE SINGLES	—	—	—	—	—	—	—	—	—	—	—	—	—	—	14.3	N/A
TOTAL	2,001.0	2,186.4	2,378.3	2,732.0	3,500.8	4,131.4	3,685.4	3,862.4	3,969.9	3,641.6	3,814.3	4,370.4	4,387.8	4,651.1	5,567.5	+19.7

Source: RIAA Market Research Committee

ITA overview

Maintaining high quality levels while developing new ways to automate and cut production costs may well be the key to coping with the economic uncertainty that is facing the US today. This is the general consensus among those representatives of the audio, video, and data industries who addressed attendees at the International Tape Disc Association's (ITA) 18th Annual Seminar in Tuscon, AZ.

In his keynote address, Dr Murray Weidenbaum suggested that, "As a nation, the only way we're going to decrease the deficits, both trade and budget, is to increase production and decrease consumption. The key is hard work." A number of speakers echoed the opinions of Weidenbaum, a noted economist who served as President Reagan's first chairman of the Council of Economic Advisors and played a major role in formulating the economic policy of the Reagan administration.

A panel of corporate economists presented their views of a marketplace that is seeing increased export, nominal growth in the coming year, a 15% drop in the consumer confidence index, and a greater number of foreign investors purchasing American businesses. The panel featured: Stephen Kagann, director of economic planning and forecasting with Eastman Kodak Company; Leo G McGinnis, manager of international economics, corporate plans department, E I Du Pont Company; John McDevitt, corporate economist, 3M Company; and Robert E Dillon, executive vice president and chief financial officer with Sony Corporation of America.

Economic concerns could not stand in the way of technological developments. A status report on DAT was presented by Mark Wexler, vice president, marketing and sales with GRP Records and Gerald Tarpley Jr, project engineer, audio components, with Ford Motor Company. GRP introduced DAT software in Europe in February, and seven DAT titles have been scheduled for release this month in the US. According to Wexler, the company will begin DAT duplication in the US with the Loran Corp this year. "DAT is the next step in the technological revolution toward music quality," he said.

Ford has introduced a playback-only DAT unit in its line of 1988 Lincoln Continentals and, according to Tarpley, "as far as software goes, the indications here are very encouraging. In fact the list of music labels jockeying for DAT introduction position becomes longer each day. The only limiting factors and questions to be raised may be the availability of blank tape, C-Os, and duplication facilities."

While new CD technologies, such as CD Video, CD Interactive, Compact Video Disc, CD Graphics, and Digital Video Interactive continue developing, CD replicators should exhibit a healthy concern about their future. Yoshi Honjo, vice president, JVC Disc

America; Paul Gelardi, president of Shape Optimedia, and Ram Nomula, president of Discronics, presented updates on their respective replication systems. They stressed the reliability of their highly automated systems and their preparation for any new CD-related programs.

However, while the future looks bright for the CD, replicators are faced with the question of how to survive the 80s. "Facilities built on volume projections that have never been realized and raw disc prices that have dropped 50%, more in some cases, over the last year have caused us to be in a quandry of how to contain and how to gather business at this point in time," said Sandy Richman, sales and marketing with AMI/Nimbus Records, who concluded the CD replicators panel.

"The first step in a facility's survival is to internally improve manufacturing efficiencies and to lower overall operating costs and, secondly, to build a solid client base and to supply guaranteed volume to your facilities."

Issues CD replicators must address in order to succeed are quality standards, reasonable pricing, since "price of raw disc has dropped so significantly over the last year that it's hard to understand . . . how we can be cost effective with the current volume," and service. "the one aspect where there is, and can be, a quantifiable difference between manufacturers."

Technological evolution is often the start in improving the balance between productivity and manufacturing costs. Updates in video included an assessment of S-VHS by Michael Capko, president of Video Marketing Services, an S-VHS facility, and presentations on high speed video duplication, by Thomas Hofbauer of Sony Information Systems and E Richard Buckley of Du Pont.

"S-VHS compatibility is part of the basis for the exciting future that VHS has," said Capko, who called the format the compact disc of video. "To the consumer, S-VHS is not a new format. It is simply an evolution or improvement of the world's most successful format." Video Marketing Services utilizes its S-VHS set up to duplicate both Super and standard VHS tapes which, according to Capko, improves the quality of the standard VHS product.

Hofbauer presented a videotape which featured interviews with *Sprinter* users as well as information on the three year old system. "Millions and millions of tapes have been sprinted," said Hofbauer. "This already accounts for 25% of the US current production capacity."

The *Sprinter* operates through the use of a mirror mother master and high-coercivity copy tape. Last summer, one million tapes were produced by Creative Video Services from the first *Sprinter*, a project which would have taken 138 years in realtime! In addition, Hofbauer announced that Sony is prepared to take orders for a *Sprinter*-based high speed DAT duplication system for delivery this summer.

Devendra Mishra, president of CVS, was part of a panel of duplicators that included: VMS's Capko; Robert Plannkuch, chairman and CEO with Bell & Howell/Columbia/Paramount Video and Larry Bennett, president Premiere Video Inc. "The high speed duplication system is far from being totally optimised," said Mishra. "High speed duplication addresses the fundamental issue of not duplicating in cassette but duplicating pancakes for the sole purpose of achieving quality control and process control."

Thermal Magnetic Duplication technology, developed by Du Pont, and featured, in conjunction with Otari, in the *T-700* high speed duplication system, is based on mirror master technology and uses chrome copy tape. Buckley discussed the pilot plant established last year by Du Pont at Bell & Howell/Columbia/Paramount which began producing some commercial product by mid-July and, by November, was providing commercial output for the video publishing and the theatrical feature film segments.

Debate continued on the feasibility of extended play or long play duplication. Celebrity Video presented tapes duplicated on the Sony *Sprinter* in LP mode which received an enthusiastic response from attendees. Plannkuch called for quality standards to be established by ITA for VHS products. He proposed standards offering technical specification and a 'quality' sticker.

"If this industry is to grow and prosper, establishing a 'Good Housekeeping' seal of approval is one alternative that should be pursued," he said.

Representatives of the video industry offered a generally positive view of the market. Stephen L Wilson, chairman and CEO with The Fairfield Group, predicted that by 1992 there will be no fewer than 75% VCR households and multiple set ownership will increase. More than 50 million VCRs have already been sold and a panel of VCR manufacturers and blank tape manufacturers predicted that the life of home video will continue strongly past this 50% penetration mark. According to Maria Curry, president/general manager with Agfa Gevaert's magnetic tape division, pancake videotape sales increased 1,500% between 1984 and 1988. She predicted a 340% rise in the marketplace for prerecorded video between 1985 and 1990, and an increase of 254% in the amount of tape consumed in the same period.

"We as an industry should strive to advise and encourage consumers of taping opportunities," said Michael Golacinski, vice president of Maxell Corp of America. Both Golacinski and John Hollands, president of Sony Magnetic Products Company, noted a flattening and slight decline of videotape sales in the past year and predicted a steady growth period in 1988. "While economic conditions are a valid concern for 1988, I don't feel the economy will adversely affect sales," said Hollands.

Susan Nunziata, New York

News from TAM

London based mastering facility, TAM Studios, have announced the purchase of the Soundmaestro hard disk editing and recording system from Audio Design Ltd. Having observed the development of the system closely TAM are convinced that it will prove to be the best readily available system, at least for some years to come.

With Soundmaestro systems recently installed in mastering facilities in Belgium and Holland, this is the first such installation in the UK. The initial software

supplied will include recording, playback, sequencing and hard editing, followed by soft editing, CD preparation (timecode, PQ listing and CD coding) and 4-channel recording all to be delivered later this year. The hardware includes Ad-Mix and interfaces for AES/EBU, Sony 1610, Sony 701 and R-DAT.

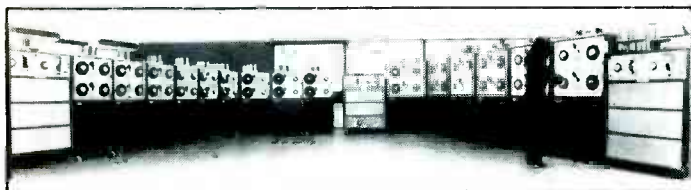
Using the system in conjunction with their existing mastering facilities, TAM will be able to offer digital editing at £25 per hour, plus master tape costs.

Micro Point lacquers

Micro Point Inc, Tokyo, has predicted lacquer production figures for the second quarter of 1988 40 to 60% above those of the first quarter.

Due to a major expansion of plant capacity which is due for completion in June, capacity will

then be four times greater than those in the second quarter. Further expansion will be implemented in stages so that by December this year the plant will have reached full production capacity.



Lyrec sales

Lyrec has supplied a third *Loopmaster Type 2509* to Sonortape Nederland BV, a major Dutch music cassette duplication plant. The plant's current capacity stands at 10m cassettes per year. The new loopbin will join the two existing Lyrec master machines and 15 twin slaves.

Managing director Dick Groeneveld commented that they

have found the Lyrec equipment to be extremely reliable. "We are constantly amazed at how stable it is. I have nothing but complimentary things to say about it." Having been a Lyrec customer since 1982, Sonortape have recently installed *Dolby HX Pro* and a *Lyrec TR55-QC* quality control machine.

Tape winding clean room

Fraser Peacock Associates (Video) is planning to be the first major UK video duplicator to install a bank of tape winders. It plans to have 15 winders in operation by early this Autumn. The fully automated and computer controlled tape winders will be housed in a specially built clean room at Wimbledon. Standards will be to Class 1000.

"In upgrading our customer facilities," said Fraser Peacock's managing director, David Tuckman, "we have two clear

objectives. First, to provide enhanced service for clients. One of the benefits of doing our own tape winding is the economy achieved by winding exact length tapes for individual film titles. That's especially relevant to the sell-through market.

"Second, as a prelude to the installation of high speed duplication systems you have to know how to wind tape. We intend to develop that expertise ahead of our major competitors."

Shape optimistic

Compact Disc manufacturer Shape Optimedia has announced orders far in excess of projected figures for the first quarter of 1988.

According to the RIAA the US compact disc market will grow 50% from 100m to 150m units per annum this year. Industry analyst Parker Barnum of Wood Gundy Brokerage Firm indicates that, assuming CD prices remain the same, 4 million players should be purchased this year with the typical player owner purchasing 13 compact discs. This will represent a total purchase of over 153.4 million CDs in the US

during 1988.

Shape Optimedia expects to increase its market share over 75% as a result of this growth. Apart from its valued customer loyalty, Shape Optimedia president Paul J Gelardi attributes the recent increase to the introduction of the 3 inch CD.

"Continued strong sales combined with substantial reductions in operating and overhead costs is working to significantly offset the challenges of increased polystyrene costs and severe price erosion due to overcapacity and foreign dumping."

Continental freight

Harbour Shipping Ltd of Dover, part of the worldwide Star Cargo Group, has introduced a new 24-hour fast customs-clearance service at Dover, which facilitates speedier passage of traffic through customs, and minimises the risk of costly delays to importers and exporters.

Harbour's new highly modern operation at Dover is staffed and equipped to service quickly the needs of Continental hauliers involved in the transport by road/sea of import/export consignments to and from the UK, using Ro/Ro ferries. Harbour can also act for any parties or agencies involved in similar activities in the UK or on the Continent who do not have their own offices at Dover.

As part of an all-embracing service. Harbour will also arrange

booking of freight lorries on Ro/Ro ferries, at very competitive charges, with preferential access to the fastest and most economic routes available.

Says Harbour's Clive Howell: "We have long been geared up to take advantage of the new, simplified procedures concerned with customs documentation which came into force at the start of the year, and we can now provide a computer-based expertise and commercial experience in all aspects of customs-clearance that cannot be bettered in the industry."

For further details, contact Clive Howell, Harbour Shipping Limited, Freight Agents Block, Eastern Dock, Dover, Kent CT16 1JA, UK. Telephone 0304-211919.



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Silverplatter CD

Silverplatter Information Services Ltd, London, has been awarded a contract by the Canada Post Corporation (CPC) to produce eight updates of the *Canadian Address File* on compact disc. The file contains over 10 million Canadian addresses, their associated postcodes and rural route information.

The contract runs for 16 months (with Silverplatter producing an updated compact disc every two months) and is the result of a favourable evaluation of Silverplatter's initial prototype.

In developing this product for CPC, Silverplatter used special indexing techniques to ensure that the average response time to a query (eg to validate a partly-known address) is less than a second. Additionally, the Silverplatter Information Retrieval system has been modified to incorporate intelligent matching to deal with bilingual address formats. Users can

choose to communicate in either English or French.

The Canada Post Corporation has installed the discs at customer enquiry centres throughout Canada and members of the public can call in free of charge to ask a CPC operator to verify a postcode. Use of the Silverplatter system has led to a 20% improvement in productivity for the CPC's customer enquiry centres.

Rob Kirkpatrick, CPC project manager, said: "This service is a further step in our efforts to increase the public's use of postcodes; the Silverplatter system has allowed us to streamline our operation internally and, at the same time, offer a superior service to the public".

The CPC work follows on from Silverplatter's success in providing the UK's Postcode Address File on compact disc (*PAF-ROM*) and is the first of Silverplatter's second generation locator products.

CD-ROM survey

MIS managers in the US are looking seriously at CD-ROM as a new medium for revolutionising the way they currently distribute information, according to a just-completed survey by Philips and Du Pont Optical Company (PDO).

The PDO survey targeted 200 management information systems executives at large industrial companies, service organisations and financial institutions. Included were firms with annual sales ranging up to \$70 billion and more than 300,000 employees.

A third of the companies surveyed confirmed that they are considering introducing CD-ROM to distribute information, while a handful revealed that they already have the technology in place. Two thirds of the companies said they are satisfied with the technologies they currently are using, while 50% said they are unable to evaluate an application for which CD-ROM might be suitable because they are unfamiliar with the technology.

All of the companies, however, share a common enemy — paper, with a majority citing the cost of handling, storing and distributing it as their chief problem. MIS managers distribute an average 9.1 million computer-generated pages each month.

In addition, the survey found that 26% of the companies contacted distribute less than 1 million documents monthly, whereas 10% move more than 30 million. But 53% of the information MIS managers distribute is moving on a daily basis. 30% is handled monthly and 17% weekly.

Although 47% of the MIS managers label paper the information distribution problem they would most like to see resolved, 27% of those surveyed want more reliable electronic systems for transmitting data.

The PDO survey also lists the major benefits MIS managers expect to derive from using CD-ROM technology. Important to nearly a third (31%) of those surveyed is the low cost of distribution by companies to their remote sites, with an identical 31% citing CD-ROM's facility for distributing archival information locally.

A desirable benefit, too, for almost a quarter (24%) of the managers is CD-ROM's ability to reduce hard copy distribution costs, whereas 11% point to its allowing both images and words to be transferred. A small percentage of the survey participants see CD-ROM playing a critical role in freeing up storage on mainframe computers.

On the other hand, 16% said that they and their companies tend to be conservative about trying new technology. Another 16% feel CD-ROM is slow compared with on-line data distribution, while 18% think the technology is too expensive.

Even so, 39% of the MIS managers contacted by PDO revealed that they now are actively considering installing CD-ROM systems for distributing information. Of these firms, five said they will have CD-ROM systems up and running during 1988 and three more will be operational in 1989.

New Music News

PSN Publications Inc, publisher of *Pro Sound News*, the *AES Daily*, and *Television Broadcast*, has been named the publisher of *New Music News*, the official daily newspaper of the ninth annual New Music Seminar.

The newspaper will offer up-to-the-minute coverage of every facet of this growing music industry convention scheduled for the Marriott Marquis Hotel in New York, July 16-20, 1988. *New Music News* will report daily on the exhibits, seminars and

performances.

Now in its ninth year, the New Music Seminar has become the nation's leading music industry convention, offering record labels, producers, recording studios and related services a forum for communicating and making new business connections.

For editorial or advertising information concerning *New Music News*, contact Paul Gallo at PSN Publications, 2 Park Avenue, 10th Floor, New York, NY 10016, USA. Tel: (212) 213-3444. Fax number: (212) 213-3484.



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WORLD NEWS

Bigger APRS?

Stand space bookings at the APRS 88 Exhibition (22 to 24 June) in London look set to exceed those of last year. Amongst innovations planned for this year's show is a new overseas visitors welcome service. Admission to the show is free to all professionals in the recording industry. Further information is available from the APRS secretary general, Philip Vaughan. Tel: (0923) 772907.

RIAA publications

The RIAA has recently published two new books: *Inside the Recording Industry: An Introduction to America's Music Business* and *A Statistical View — Update '87*.

Inside the Recording Industry provides a general guide to the creation of recorded music with information on manufacturing, distribution and technology. Also covered is the whole process from the signing of an artist

through to the marketing and sales of its release. There are also new sections on government relations, home taping and music in society.

A Statistical View — Update '87 contains industry information which is updated annually by the RIAA.

Evermark move

Evermark Tape Inc has moved to new expanded premises at 1201 Olympic Boulevard, Santa Monica, CA 90404, USA. Tel (213) 458-2898.

Change of address

Sanyo Fisher (USA) Corporation has moved to new corporate headquarters. The corporate offices and Consumer Electronics Division may now be found at 21350 Lassen Street, Chatsworth, CA 91311, USA. Tel: (818) 988-7322. The Industrial Video Department is at 1200 West Artesia Blvd, Compton, CA 90220, USA. Tel: (213) 537-5830.

Robotic cassette production

Martin Industries has supplied two Cam robots to GTS Fabrications in Wales which operate a pick and place function on the company's fully automatic audio cassette cases production line.

The robots fulfil the function of twelve human operators previously required to keep that section of the production line operating 24 hours a day. They take cases from the moulding machines and transfer them to the packaging department. In this way the cases go from moulding machine into a box without being touched by human hand, thus improving cosmetics. According to Ceri Davies, managing director GTS Fabrications, the new robots cut wastage and reduces the company's overheads.

Dolby agent

Studiotec has been appointed as Dolby Laboratories' new

distributor for studio and cinema equipment in Finland. Studiotec can be contacted at Kuusiniemi 2, 02710 Espoo, Finland. Tel: 090-592055.

Lubricated tape

FWO Bauch have asked us to point out that they still supply lubricated ¼ inch magnetic recording tape. Available in pancakes or on plastic reels we understand this is the only UK source of Scotch 219 back lubricated tape.

Ampex appointment

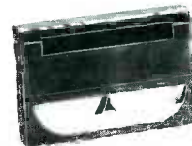
Ampex Magnetic Tape Division has appointed Marty Blanchard as senior market research and planning analyst. She will be responsible for the co-ordination of the division's strategic long range planning, as well as tracking industry activity and trends.

Blanchard has been with the company since 1969 and has a BSc from the University of San Francisco. She is chairperson of the International Tape/Disc Association's blank tape statistics committee.

High Quality DAT CASSETTE MECHANISM

DAT
Digital Audio Tape

Dai-Ichi Seiko has developed R-0 DAT cassettes. The tape openings and hubs are covered with sliders (lids) which prevent dust and other foreign matter from entering the interior. These tapes, which are based on the DAT technical specifications, are highly reliable and uniform in quality. This has been achieved by pursuing the precision of each part.



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TDK Limited Edition cassettes

TDK have released two of its tape formulations in a new 'limited edition' series. The new 'rounded corner' packaging and overall styling is specifically designed to appeal to the younger purchaser.

The new range includes a brand new formulation — TDK AR, a ferric tape using NP (Non Porous) particle technology. The new HP-AR shell features multi bonding for extra rigidity, an enlarged H-shaped window bonded at 12, rather than the more usual four

points and a dual-material, anti-resonant moulding. AR Limited Edition will be available in all black or white with pink hubs.

TDK's Type II formulation, SA will be available in a new Super Precision SP-AR shell. SA Limited Edition will only be available with a black case and matching black shell.

TDK UK Ltd, Pembroke House, Wellesley Road, Croydon CR0 9XW, UK. Tel: 01-680 0023.

RTI TapeChek 4150

Designed to meet the quality control needs of tape loaders and duplicators, RTI's new TapeChek 4150 pancake evaluator identifies magnetic and physical defects in new tape at over 2000 times play speed. The unit is fitted with Micro-Pulse, a multi-track dropout detection system which is claimed to check thoroughly and accurately any pancake before recording or loading.

TapeChek 4150's colour CRT graphically displays problems identified in the tape. A bar graph shows dropouts and physical defects in six selectable time scales. Among the displays are

detailed dropout reports and a diagnostic report of machine parameters.

The TapeChek printer also provides hard copy recap reports of tape condition.

RTI TapeChek 4150 is claimed to be fast and efficient to operate, and requires virtually no operator assistance thanks to microprocessor electronics.

RTI, 4700 Chase Avenue, Lincolnwood, IL 60646-1689, USA.

Tel: (312) 677-3000 or from Illinois, Alaska, Hawaii or outside the USA (800) 323-7520 (Toll free).

Elison YSMA12 background noise reducer

The YSMA12 is a 'background noise' reducer originally designed for the motion picture industry but with applications in audio and video mastering. Although described as a noise reducer there is no encode/decode process. The unit works by dividing the audio signal into 12 frequency bands (at first glance the unit looks like a graphic equaliser) then processing each band using separate compressor/limiters, phase inversion, time constant detection and signal

summing techniques. Not all the filters are active at any one point in the programme, each band is set to a preset noise threshold.

The YSMA 12 has two electronically switchable inputs and a 600 ohm balanced output each frequency band features a green LED (signal present) and a red LED (overload) and the unit is provided with an output meter and input level control.

Elison, 112, Rue de Tocqueville, 75017 Paris, France. Tel: (1) 42 27 13 04.

Harmonia Mundi modules

Harmonia Mundi have developed three new modules for their *hw102* digital signal processing and transfer system. The *Redither* module is designed to eliminate quantization distortion of low audio levels created when internal 24-bit processing is requantized to 16-bit for 'external' storage or manipulation.

The *Analog to Digital Converter* has been designed to further exploit the potential of digital recording. It provides 18-bit (16-bit selectable) resolution and a 108 dB dynamic range. The A/D can be used with standard line level stereo signals or microphones and has a switchable phantom power supply.

Other features include variable input level controls, input metering, selectable 44.1/48 kHz sampling; high pass filter (for DC offset cancellation); Apogee anti-aliasing filters and two times oversampling.

The unit is completely self contained in a single space 19 inch rack mount frame and comes with standard AES/EBU output and two free slots for standard HMA modules.

The third new product is the

Rehearsal module. Designed to remove the tedium of continually rewinding the master tape the *Rehearsal* module stores around 10 seconds of two-channel material with 16-bit resolution and 48 kHz sampling (20 seconds with optional memory, 40 seconds in mono).

An adjustable delay varies the moment the recording is terminated relative to pushing the Stop Recording key. This feature enables the operator to record the 'future' or the 'past' relative to the stop command. Endless loop replay is provided with independently adjustable begin and end points. Cross fading provides a smooth transition between the beginning and end of the programme. A cue point can be logged into the system and the user can replay the memory either up to the cue point (Pre), or from it (Post).

Half speed playback is possible and all programme functions are software controlled from a remote module in the *hw102* control desk. **Harmonia Mundi Acustica, in den Sigrismatten 6, D-7800 Freiburg, West Germany. Tel: +(0)761 49 15 06.**

Fostex digital master recorder

Fostex have developed a prototype DAT master recorder which is claimed to be compatible with SMPTE/EBU timecode data.

The format allows the timecode to be read at both normal speed and during high speed search (more than x100). All frame rates can be recorded in the sub data area of the tape and the original soundtrack and data information conform to the current R-DAT specification for consumer use. Tapes recorded on the Fostex prototype are therefore

interchangeable with tapes recorded on consumer equipment.

In addition to the timecode facility the new unit provides V-sync with video equipment and word sync with DAT. Subcode data features double error correction and double parity for reliability. A release date has yet to be confirmed.

Fostex Corporation, 3-2-35 Musashino, Akishima, Toyko, Japan 196. Tel: 0425-45-6111.



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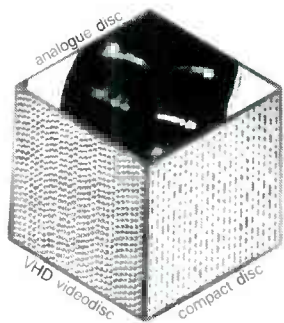
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Quality First

JVC Disc



Division

The Victor Company of Japan Ltd (JVC) was founded in 1927 when it was originally known as the Victor Talking Machine Company. In 1930 the company opened the largest record pressing plant in Asia. Today JVC's Disc Division produces vinyl records, compact discs and VHD videodiscs.

The original pressing plant was located in Yokohama, the second largest city in Japan and just 15 miles or so to the South West of Tokyo. In 1962 increased demand for vinyl records resulted in a record plant being opened just to the north of Yokohama at Yamato.

Due to continual development and expansion, in 1976 a third plant (Rinkan) was opened on a site within walking distance of the main Yamato plant.

Today the three plants have become quite specialised. All the analogue cutting and laser mastering is now done at Yokohama (the Aoyama cutting facility in Tokyo closed last September). This is where the metalwork is also produced. Production stampers are then shipped from Yokohama to Yamato where the Yamato plant produces VHD videodiscs and the Rinkan facility presses (in different buildings) analogue discs and CDs.

Yokohama Plant

Although the Yokohama plant produces all the metalwork there are basically separate, self contained sections for CD, analogue and videodiscs. This is not a vast integrated system but three separate facilities all in the same building, each tailored specifically to the needs of the end product.

There are no recording or editing facilities at Yokohama. Video editing and CD pre-mastering is done in Tokyo, at JVC's main Aoyama Studios. Once the final tapes have been prepared they are sent to Yokohama for the first manufacturing stage, ie disc cutting, CD laser cutting and videodisc laser cutting.

JVC is a name known around the world, especially in the field of hi-fi, TV and video recorders. What may surprise many people is the length of time they have been involved in disc manufacturing. Carl A Snape reports on the current activities of the Disc Division.

A single glass master preparation area serves both the CD and videodisc cutting rooms and this is located adjacent to the individual master cutting room.

JVC polish their own glass masters and will re-polish the glass substrate up to 50 times before it is finally discarded. After polishing the substrate is washed and then coated with photo resist. The room is filtered to Class 10 standards.

In all the Disc Division has five laser mastering machines. All were designed by JVC. Three are specifically for VHD videodiscs and two are for CD mastering. Videodiscs can be produced in either NTSC or PAL format. Cleanliness in the videodisc cutting rooms is to Class 100. During the actual cutting process no operators remain in the room. This, coupled with the additional clean air filtering surrounding the laser cutting machines, provides virtually Class 0 cleanliness according to JVC. A separate control room is equipped with three sets of signal, monitoring and control equipment for each cutting machine.

Each system can send any of three cutting machines the master signal. On average it takes 1.5 hours to cut a videodisc. Cutting takes place 24 hours a day, everyday except during Christmas, New Year and the summer holiday period.

Class 100 cleanliness is standard in the CD laser mastering rooms, again with additional filtration around the actual cutting area. A 70 minute programme would normally take two hours to master. There are two shifts with two operators specifically for CD mastering.

Most of the U-matic tapes are replayed via the JVC *DAS 900* digital audio system although of course there are facilities for replaying Sony format (1610/1630) tapes. After cutting and development the glass masters are sealed in air tight containers and taken down the corridor either to the CD or VHD plating departments.

Plating

To produce their final stampers, JVC use a conventional wet silvering process followed by pre-plating then high speed electroforming. Although the process is similar to that used for the production of analogue stampers, all the various processes for each format are kept entirely separate. Different equipment is also used and unlike the analogue vinyl stampers, CD and videodisc stampers are not chrome plated.

In the CD and videodisc sections, separate rooms are used for each stage of the process. This is so that the level of cleanliness can be carefully controlled. High speed electroforming, where the final embossed surface has already been covered (by the pre-plate), is to Class 10,000 standards. Pre-plating and silvering is maintained at Class 1000 however, with the silvering tanks and the six pre-plating baths, all having additional clean bench filtering in order to further reduce contamination.

Each plating bath is computer controlled.

DISC MANUFACTURING

The system not only monitors temperature, pH and the concentration of the solutions but can also detect and report on any foreign particles in the system.

Normally CD pre-plating takes 2 hours, master electroforming 1.3 hours and mothers and stampers both take 1.6 hours to grow. Due to the nature of the Japanese market (average CD orders are 1000-1500 units) typically 2-3 mothers are made from one master and three stampers. On average a CD stamper will provide 10,000 discs and a chrome-plated vinyl stamper, 50,000.

After finishing the final stampers are checked before shipping. According to JVC they expect to get a 97% yield rate with stampers, which seems to be quite constant. To get 98% however is apparently extremely difficult.

In many ways the Yokohama plant provides a classic example of succeeding in the face of adversity. It is difficult to believe that CD laser mastering and metalwork — never mind masters and stampers for videodiscs — are made to such high standards when you step outside the factory and see just exactly where the plant is located.

On all sides there is heavy industry — this is after all Tokyo's international sea port. Large heavy lorries are constantly passing by. The local air base is literally just down the road so jets come thundering overhead. The air gets filled with volcanic dust from time to time and of course there are the earthquakes! The massive air cleaning systems that sit across most of the roof area show that this is not the sort of environment where you can do things by halves. Once inside the plant however it's a different world and that says much for JVC's uncompromising attitude.

Rinkan CD Plant

Unlike Yokohama, Yamato is in a much more rural area and the two sites (Yamato and Rinkan) are located in a fairly high tech industrial area along with companies such as IBM and NEC.

The Rinkan CD plant actually consists of two buildings: The original building which now holds eight injection moulding machines (with space for another four) and a brand new adjoining extension which contains 11 injection moulding machines. At ground level there are effectively two CD manufacturing areas with separate sputtering and coating facilities, upstairs the printing, inspection and packing departments are integrated into a single work flow area.

The metalwork containers from Yokohama are opened in the press room thus avoiding unnecessary contamination (the containers are loaded under clean room conditions). As with much of the plant a lot of the work at the pressing stage is automated. Each disc requires 16 grams of polycarbonate which is injection moulded at 300°C then stacked, 100 to a spindle, by robot arms. The injection moulding machines are made by Nestal but the overall system, has been both designed and made developed by JVC.



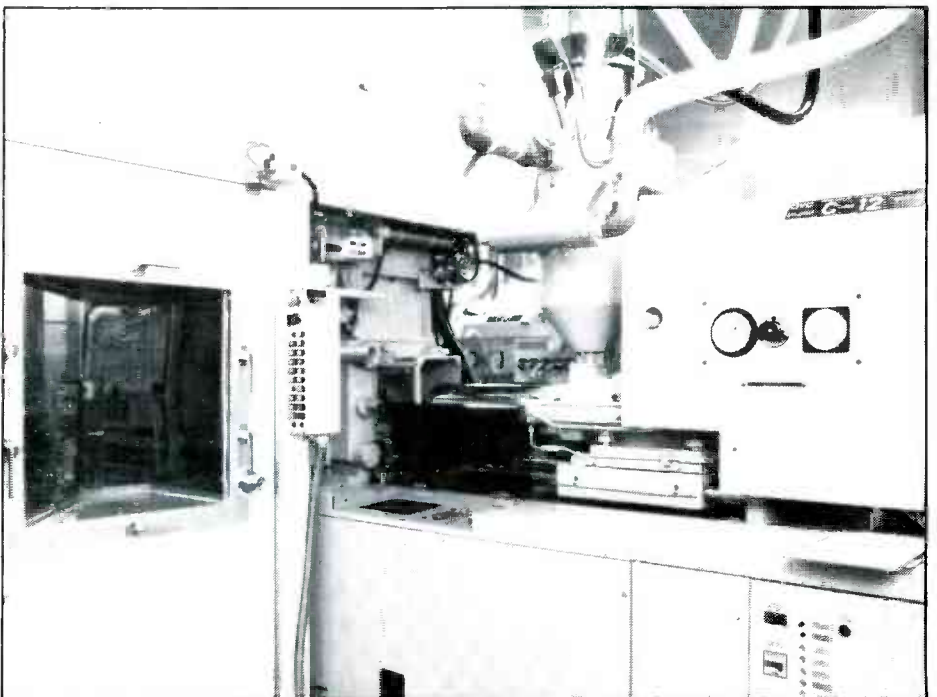
CD cutting system



Making mothers



Pressing equipment in the new extension



Pressing equipment — detail

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DISC MANUFACTURING

When the spindles are fully loaded each batch is identified with a different coloured, CD-size, polycarbonate disc. This way it is possible to quickly check which group of workers have produced which discs. (There are three shifts and four groups to each shift).

When sufficient discs have been pressed they are automatically carried by robot car to the next section and centre punched then moved by a second computer-controlled car to the sputtering department. Metallizing is done in batches of 35 trays, 24 discs to a tray using 99.99% pure aluminium.

A new innovation at Rinkan is pure gold metallizing (not coloured polycarbonate as used with CDV). Pure gold being more reflective is claimed to help reduce replay errors and JVC are already marketing gold CDs in Japan.

In all there are eight Ulvac metallizers (four in each building). Sputtering takes between 30-35 minutes, after which the discs are lacquer coated in batches of four, UV-cured, then automatically conveyed by remote car (via a special lift) to the floor above.

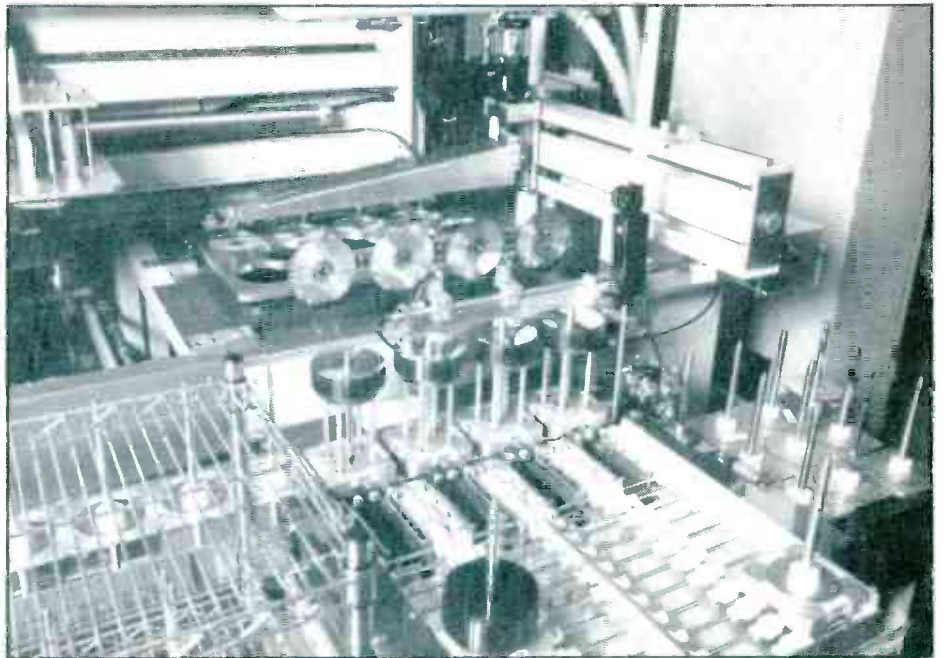
Printing & Packaging

On the upper floor almost $\frac{2}{3}$ of the area is set aside for packaging, storage and general offices. Of the remaining $\frac{1}{3}$ about half the floor area is devoted to printing and half to inspection.

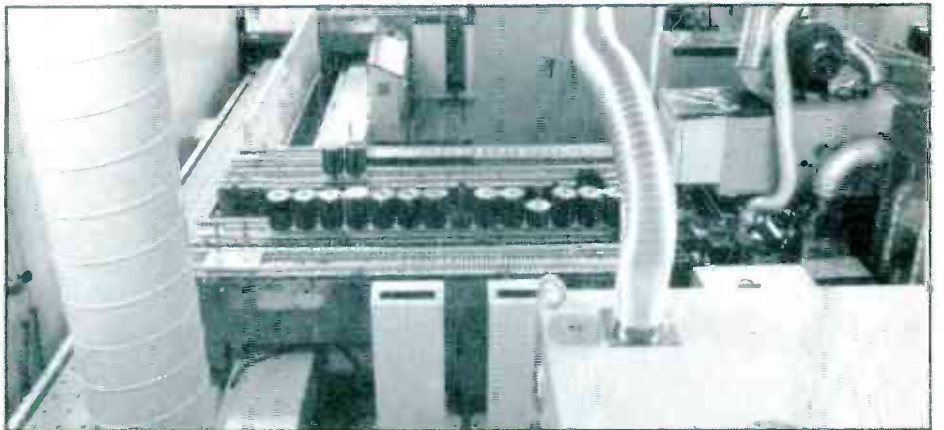
JVC use silk screen printing machines capable of printing up to four different colours. By introducing discs later in the line single or 2-colour operations can be provided. According to the Mr Isao Takaizumi, general manager 3rd production dept. JVC use silk screen printing because of the higher purity of the colours. He didn't feel that JVC's customers would find tampon printing of acceptable quality.

JVC have developed their own automatic inspection system. It takes on average 10 seconds to check the optical parameters of the disc and in most cases sample discs are taken at the start and end of each batch.

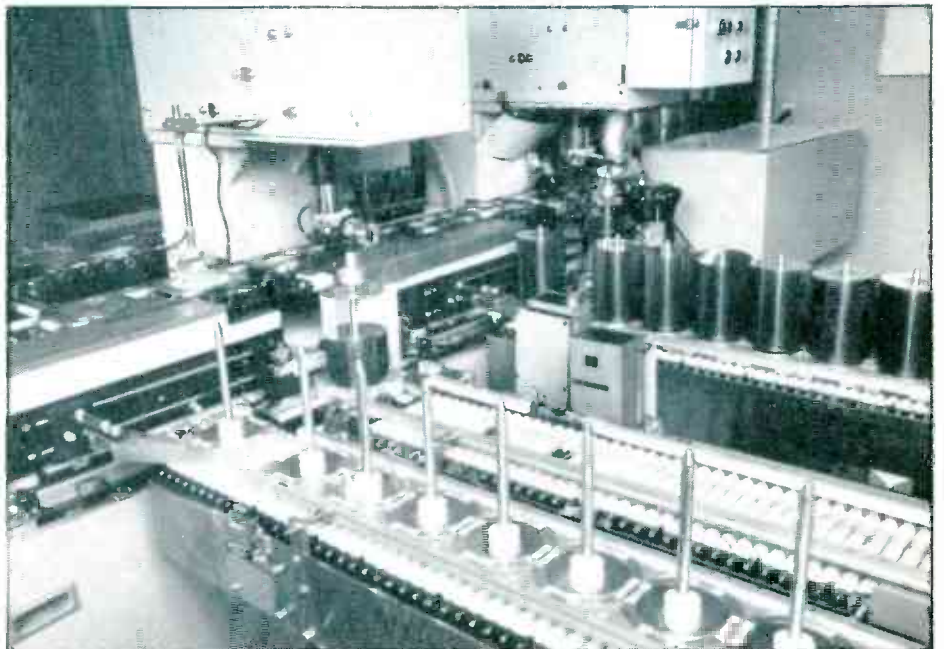
The boxing and packaging equipment is a completely automated process again



Auto tray loading after metallization



Spin coating and UV curing



Spin coating — detail



Special insert (left)

DISC MANUFACTURING



Right. High speed visual inspection machines developed by JVC for detecting inclusions, spots and scratches etc.



Left. High speed CD signal inspection machines (eight in all) and process computer.

designed by JVC. Unlike the more conventional 'rotary' system this is a straight, in-line process, running several metres down the factory. Two such lines have been installed at Rinkan.

A supply of empty boxes is automatically fed in at one end, the lid is automatically opened and the inlay card put in. Next the inner tray is put in, the booklet is picked up and inserted, the disc put in and finally the lid closed. Essential for the Japanese market is an outer, narrow paper cover that is folded round the spine (it promotes the recording and carries the recommended price). Once the cover is in place the discs are shrink wrapped and automatically packed in cardboard boxes — 50 to a carton.

It all sounds deceptively simple but in actual fact there's considerable innovation needed to resolve many of the problems. The most difficult of these is the seemingly simple

action of picking up the inlay card and the booklet. Because some record companies supply their own print (JVC own their own printing company) variations appear in paper quality, thickness and overall dimensions. In order for the system to work, all these variations have to be taken into account. One problem with robots of course is the fact that they are programmed to work precisely and so it is difficult to design straight forward automated equipment to cope with these types of variables.

In the beginning JVC used a vacuum lifting system but it simply couldn't cope with the un-specified dimensions. Back to the drawing board and the revised design incorporates a squeezing action. Now the equipment picks up the booklets and inlay cards in a similar way to the human hand and the problem has been resolved.

As with most of the raw material in the

plant, movement of printed material is computer controlled. When an order is entered into the computer a robot car is automatically despatched to the warehouse, goes to the shelf with the appropriate inlay cards and booklets and takes them to the required work station. If the print has been produced outside, the printed materials are stored in special trays so that they can be easily handled by the robot system.

When the cartons of 50 discs have been stamped and identified they are automatically loaded onto plastic pallets and placed in the despatch area. From here they will be despatched around the world or in the case of domestic product sent, via a distribution company, to the local record retailers.

Next month, in the final part of this feature, we take a look at the VHD plant at Yamato and talk to the Victor Company of Japan's recently appointed managing director, Mr Kansaku Kaneko.

I would like to thank Mr Junuchi Tanaka for his help in arranging my visits to the individual plants and acting as interpreter.

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Winners and Losers?

After more than ten years of talk and promises, high speed duplication for video is now a viable, commercial reality. As recently reported TapeTech looks like becoming the first company in Britain to use the thermal magnetic duplication process on offer from Du Pont and Otari. The rival system, Sony's *Sprinter*, is already being used in the US and Holland. Although film company Vestron has done little or nothing to publicise the fact — and its staff seem always to be 'in a meeting', the public can already buy 'sprinter' tapes from Vestron.

The gloves are now off for a battle between the two rival systems.

The background to this battle is a messy tangle of politics and technology, poor communications, corporate arrogance and clumsy public relations work. TapeTech is effectively gambling £4 million on the strength of promises that the TMD process, still being perfected for PAL, will be delivered on time and do what it promises.

Although TapeTech talks of being the first TMD user in Europe, the first machines may well be installed in Holland, and used as a proving ground.

If the deal turns sour, and TapeTech uses escape clauses built into its contract, the company will be left with a wholly inadequate production capacity for demand this winter. If all goes well, TapeTech will become one of the largest tape duplicators in the world.

Says David Tuckman of Fraser Peacock, "With this kind of investment I am pleased — proud in fact — to be number two".

The decision by TapeTech to buy TMD equipment, instead of *Sprinter*, was taken at the last minute (February) and surprised Sony. The Japanese company is unlikely to take this rebuff laying down. Already there are rumours of a next generation *Sprinter* which will out-perform TMD.

When the final history of video duplication is written, it will make fascinating reading. Here is the story so far.

Are we set for a major video war? Barry Fox examines the opponents, the battleground and the strategy in the world of high speed video duplicating.

Theory

The idea of high speed duplication is as old as video itself. Ampex and Matsushita (Panasonic) were working on an AC transfer system — the precursor to Sony's *Sprinter* — well over ten years ago. The principle is simple. When two tapes are sandwiched together, one of higher coercivity than the other, there is a tendency for the magnetic pattern to print through from the higher coercivity tape to the lower coercivity tape. It is exactly what happens when reels of tape are stored for long periods of time without re-use or re-winding, and there is unwanted print-through from one turn of the tape to the next.

Transfer is much more efficient (which is a bad thing if you are trying to avoid print-through and a good thing if you are trying to make duplicate copies) if the tape sandwich is subjected to an AC magnetic field. This temporarily agitates the magnetic particles. When the agitation force is removed they tend to mimic the magnetic pattern created by the sandwich, i.e. the blank tape copies from the master.

This system only works well at short wavelengths. So high frequency video signals copy well, but low frequencies will not transfer efficiently. For this reason AC tape copiers often make quite separate recordings of the linear audio and control pulse tracks, using conventional stationary heads.

The thermal magnetic duplication system, now perfected by Du Pont and Otari, was invented in the 60s. The blank tape is coated with chromium dioxide, which has a very low Curie point of around 120°C. When the tape sandwich is heated to a temperature above the Curie point, the coercivity of the chromium dioxide drops to around 5 oersted and then climbs again back to normal VHS/Beta levels (650-700 Oe) as soon as the temperature falls. As this happens the tape picks up any magnetism to which it is subjected. So, if in a sandwich, it makes a copy of the master tape.

Obviously in each case the copy is a mirror image of the original, so a special master must be prepared which is itself a mirror image. The final copy is then the right way round.

The advantage of thermal duplication is that both high and low frequencies transfer equally well, so both the audio and pulse control tracks are copied along with the high frequency video signals. When TMD was first proposed, heating the tape proved a practical problem. But as high power infrared lasers became readily available, the system started to look viable.

Although Ampex dropped out of the high speed race early, Matsushita stuck with it. The Japanese company developed an AC transfer machine for use with the old EIAJ ½ inch video tape cartridge, which unsuccessfully rivalled U-matic in the early 70s. The tape cartridge system was abandoned and Matsushita gave its prototype HS copier to Brighton Polytechnic in the UK. The Japanese company then developed a similar system for VHS and several times over the last 10 years has published glossy publicity brochures proclaiming the many virtues of the 'National high speed VHS video tape printer'. This was claimed to copy a two hour tape in four minutes. But despite repeated announcements and promises the system was never commercially marketed.

Sony pursued the AC transfer system,

VIDEO DUPLICATION

with *Sprinter*. Like the Panasonic AC copiers, *Sprinter* was many times promised and publicised, before it was ready for sale. At the 1981 Berlin Radio Show, for instance, Sony showed a *Sprinter* machine, capable of copying at 60 times normal speed — with political sensitivity acknowledging in the German press release that the idea dated back to a 1941 proposal by German engineers.

The first genuine sales of *Sprinter*, NTSC machines, was in 1984. The biggest customer has been Modern/High Speed Video, of Malvern, Pennsylvania. High Speed Video also has a factory at Helmond in Holland, near Schipol Airport, with 10 *Sprinters*. In an ongoing tea party shuffle, this company was recently bought by tv services company Carlton Communications.

All this talk of high speed duplication caused considerable confusion in the early days of video. When the solicitor for FACT, the Federation Against Copyright Theft, talked to the press about piracy, he warned about *Sprinter*. It turned out that he thought the machine could be used to make a copy of a 35mm film in a few minutes, so making life easier for crooked cinema projectionists.

For years 3M worked quietly on a system which would avoid the major disadvantage of both the other systems — the need to prepare a mirror image master tape. 3M tried to build a machine which used a steel band between the master and copy tape. In theory, the master copies onto the steel band and the steel band copies onto the blank tape, thereby providing a 'right-way-round' final copy from a 'right-way-round' original master. After years of expensive research, 3M abandoned the project. It proved too difficult to get the relative coercivities of the tapes and band right, so that signals copy without erasing.

Most recently a fourth technique has been under investigation, by the joint venture between Bell and Howell, Columbia and Paramount (BH/CP) in the US. This is to make high speed dub recordings, on open reel slave machines, with the tape and head drums running at several times normal speed. BH/CP is already using double speed recording and 48 hour pancakes at a test bed in Northbrook, Illinois, and has been experimenting with ten times speed recordings. But as this puts the signal frequencies involved up to 50MHz, and drum speeds up to 15,000 or 18,000 rpm, there are finite limits on the technology.

Rank is buying BH/CP and talking of replacing the existing management. No tears on this score will be shed by those who have experienced the misery of trying to deal with BH/CP.

Last autumn I asked Bell and Howell in Britain about the TMD process and was referred to Illinois. From Illinois I was referred to California but my calls were never returned. It took a month for the Chicago office to give even monosyllabic answers to simple questions put by B&H in Britain.

BH/CP has for three years run a TMD test production facility at Northbrook near Chicago. Du Pont has been restricted, by an agreement with BH/CP in America, but there are no such restrictions in Europe. So, unhindered by any agreements with BH/CP in Europe, Du Pont and Otari were free to go rooting for business. This is why TMD equipment is due soon to be installed by duplicators in Britain, Spain, Italy and Holland.

One can only hope that the firms now committing millions to TMD technology will continue to get such full cooperation after cheques have been signed.

It was in fact Bell and Howell who first took a serious interest in thermal magnetic duplication, buying patents filed in the 60s by James Lemke of California. This coincided with an interest, which was very much self-interest, by Du Pont (full name E I du Pont de Nemours and Co of Wilmington, Delaware) which describes itself as the largest chemical company in the world. Du Pont was interested in TMD, and the Bell and Howell process because it relied on the use of chromium tape. BASF shares this self interest.

Chrome

In the beginning — that is to say in the late thirties when BASF and AEG Telefunken first developed a magnetic tape recording system — the tape was coated with gamma ferric oxide. The quality of ferric tape has been continually improved over the last fifty years, with finer, more regular, particles and higher coercivity achieved by doping the ferric mix with cobalt. In the fifties Du Pont, developed — and patented — a way of making ferromagnetic chromium dioxide. Chromium dioxide does not occur naturally; it must be synthesised.

Du Pont had discovered the process whereby chromium trioxide is decomposed in the presence of water at high temperature and high pressure, to produce crystals of chromium dioxide. These crystals are very small, and long and thin, like needles. They also tend to be consistent in size, unlike gamma ferric particles which initially suffered from physical deformities, like holes and branch-like dendrite imperfections.

Du Pont patented not just chromium dioxide, but the method of making it as well. This gave the company a very strong legal monopoly. Anyone who wanted to make chrome tape had to buy a manufacturing licence from Du Pont.

In 1966 a tape recording engineer visiting Philips in Eindhoven, suggested that chrome dioxide might be the ideal medium for the then-new compact audio cassettes. At that time chromium dioxide tape was still not commercially available. Philips asked Du Pont for specimens, checked them and concluded that chrome dioxide tapes would be suitable not just for compact audio cassettes, but also for the video cassettes which Philips was

then working on with Sony. The first commercial application for chromium dioxide was in fact in a reel of video tape made by Philips for its early home video open reel machines.

The first compact audio cassettes using chrome tape were manufactured and sold by Du Pont under the name *Crolyn*, largely due to the enthusiasm of Henry Kloss and his Advent Corporation which made a cassette recorder optimised for the use of chrome tape. At that time, 1970, BASF took a licence from Du Pont for the manufacture, development and worldwide marketing of chrome tape and chrome dioxide coating pigment. From 1971 onwards BASF pushed chrome hard, so did Philips. It was the only tape which gave good results from Philips' ill-fated V2000 home video system.

In addition to Philips and BASF, Du Pont also licensed Sony, Ampex, Memorex, 3M and Agfa, and later IBM. But only BASF was licensed to make the raw coating powder. The others had to buy it from Du Pont or BASF, and then pay a royalty on tapes made. Very few Japanese companies took out licences, largely because Du Pont initially signed an exclusivity deal with Sony and partly because there were fears that the manufacturing process released dangerous by-product waste chemicals.

In the 70s, Japan had just discovered the wisdom of protecting its environment, after the Chisso chemical company fouled the sea water in Minamata Bay, contaminating fish and poisoning the people who ate it.

This is why the Japanese devoted their energies to making cobalt ferric tape, and criticising chrome. Both Du Pont and BASF continually fought off claims, originally from Nakamichi, that chrome tape was highly abrasive. Smoother coatings solved the problem.

The original chrome patents, filed in 1955, expired in the early 70s. A long string of patents subsequently filed, including a vital process for stabilising the chemical mix, lasted through the 70s and into the 80s; the last important patent expired in May 1987. But by then Du Pont had quit the tape business, forming a joint venture (PDM Magnetics) in 1981 with Philips. PDM has Philips' old tape factory at Oosterhout in Holland. Last year Agfa Gevaert said it was joining forces with PDM to form a new company with pooled manufacturing resources to fight the Japanese competition. But Philips and Agfa failed to agree on terms and the idea died.

When PDM was formed Du Pont gave up trying to enforce the licences on the manufacture of chrome tape. But BASF remained a licensee, to make powder. Although BASF has patents of its own on chrome technology, the company still pays a royalty to Du Pont. Du Pont also still makes coating powder.

Since 1981 tape companies have been able to do what they like with chrome mix bought either from BASF or Du Pont. But Du Pont

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says it no longer uses the original production process, and the modern process is covered by recent patents which are still in force. So any chemical company wanting to make its own chromium dioxide coating mix would either have to develop an entirely new process or take a licence from Du Pont and possibly BASF as well. The chrome tape market is thus still well and truly sewn up. Although tape companies can compete on price they are still all beholden to the same very limited source of the vital coating mix. This does not bode well for chrome tape prices if the TMD process becomes more popular than *Sprinter*.

Paul Bradley, sales and marketing manager for TapeTech accepts that "the whole raison d'être" for Du Pont's interest in TMD, is to sell more chrome tape. He accepts he is locked into buying chrome but believes source competition will keep costs down. Time will tell.

Patents

Du Pont also talks about patent protection on the TMD process. Although there will inevitably be patents on modern know-how, one of the Lemke master patents is already dead and the other is due to expire this coming July. Trying to get in quickly before expiry, BH/CP sued an American duplicator, Creative Video Services, in May 1986 for infringement through the use of *Sprinters* supplied by Sony.

The Lemke patents cover the method of copying, and making the mirror image master tape, not the hardware. This is why BH/CP sued CVS, not Sony. But Sony quickly came to the aid of CVS with a counter suit in June. This claimed that the Lemke patent was invalid. Both parties withdrew their suits and reached an out of court settlement. BH/CP gave Sony a licence in return for a promise not to attack the patent. After July, when the last patents die, there is no legal bar to other companies offering TMD and AC transfer systems based on the same basic idea.

TapeTech spent 18 months evaluating the rival *Sprinter* and TMD systems. Up until February 1988 TapeTech (and Sony) thought they were buying *Sprinter*. The change of heart came after visits to Otari in Japan, who welcomed input on PAL requirements.

"Du Pont and Otari showed far more interest in selling to us", says Tapetech MD Alastair Bowes. "We couldn't get the information we needed from Sony. The message we got from the Sony hardware people was '*Sprinter* is here to buy if you want it.' The Sony tape people were much more helpful. They are supplying tape for either system".

Tape

TDK and Sony are the only sources of metal mirror mother tape, and so far only TDK, PDM, and Sony are offering blank tape suitable for TMD. But BASF and Agfa will soon be ready, too. BASF and Agfa tape has

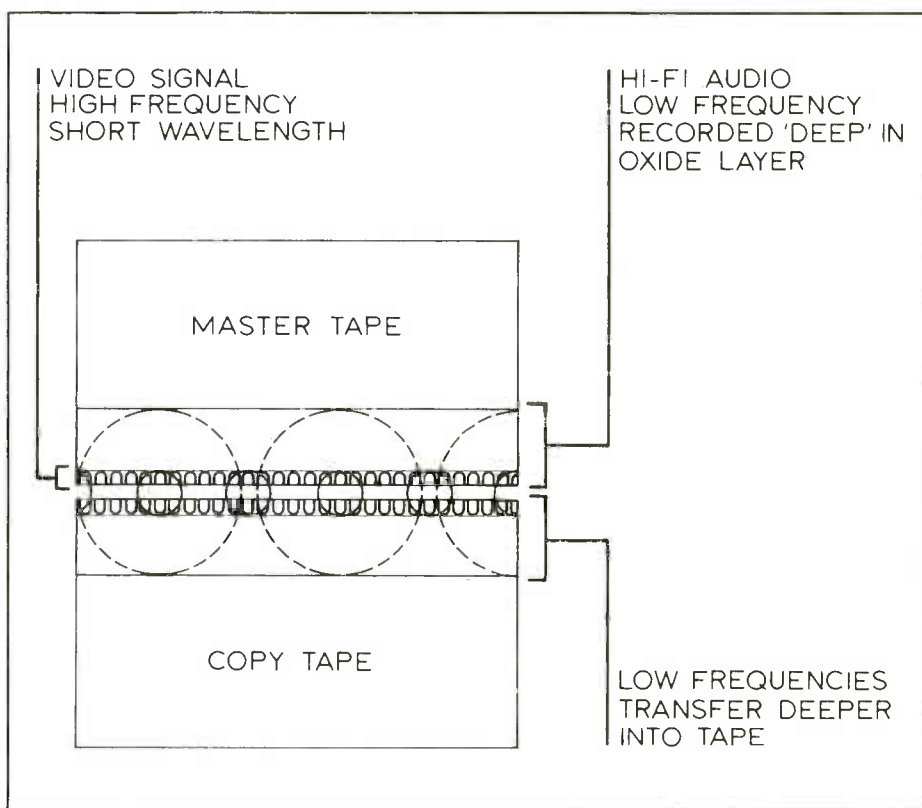


Fig 1. Hi-fi video recording

not previously been suitable because it is believed they include some cobalt ferric in the mix. Also their current coatings are too thick. The copy tape is heated from the rear side, and the thicker the tape and oxide layer the more heating there has to be to cause transfer. With current BASF and Agfa coating thicknesses, the laser power would have to be increased. It is obviously easier (and as a bonus, cheaper on the costs of coating material) to reduce the thickness of oxide coating.

When announcing the decision to buy TMD, TapeTech showed the press a publicity video made by Du Pont and Otari. But Alastair Bowes felt obliged to apologise afterwards (eg to JVC and Panasonic) for its 'over the top' criticism of rival technology, eg suggestion that only Du Pont and Otari offer after sales back up.

The press were surprised that no-one from Du Pont or Otari showed up at such an important press conference, leaving TapeTech to try and answer all questions. "They now have the deal tied up" admitted Bradley.

Otari/Du Pont has clearly hard-sold TMD. Here are some of the claims, questions and answers which swayed TapeTech:

Although the PAL TMD system is still in the final stage of development, O/DP has promised that delivery will commence in June and final installation and commissioning will be completed 'no later than mid-August this year'. Seven TMD units will give an annual capacity of 5 million cassettes, equivalent to 1,400 realtime VCR slaves.

Sprinter copies at 3.6 metres per second

which is equivalent to 150 × realtime for PAL; TMD copies at 4.5 metres per second, equivalent to 190 × realtime, ie 25% faster. The added TMD bonus is Otari's continuous loopbin master, which eliminates the need to re-wind.

Time lost on re-wind reduces the effective speed of *Sprinter* to about 80 × realtime. Allowing for pancake changes and down time (including replacement of the TMD Krypton laser every 500 hours or so) TMD speed ends up at around 160 × realtime. So output of each TMD machine is double that of *Sprinter*. Why then has Sony sold at least 60 *Sprinters* in the US, against no TMDs?

US sales

BH/CP has been testing at Northwood, Illinois for 3 years, but only producing tapes in commercial volume since last November. And realtime NTSC slaves are half the cost of PAL slaves.

Also TMD in NTSC runs at 135 × realtime instead of 190 × realtime for PAL.

"So the 'to invest — not to invest' decision is not so clear-cut in America as it is in Europe", says Bowes.

S-VHS and Hi-Fi

Du Pont and Otari have told TapeTech that TMD can be used for S-VHS. Because no-one from Otari or Du Pont was present, TapeTech were left in the unenviable position of not being able to justify this claim.

Admitting that he is merely repeating what Otari and Du Pont have told him, Mike

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Johnson of TapeTech says he believes this is because of the difficulty making heads for mirror master recorders.

Because S-VHS tape is of higher coercivity than standard VHS tape, *Sprinter* mirror master coercivity for S-VHS must be higher and the heads made from sendust. But if the heads are wider than 30 microns, ie as needed for VHS video rather than DAT or 8mm Video, they tend to shatter.

"We just couldn't get the right answers from Sony on points like this", says Johnson.

"We could not get the information we needed" adds Bowes. "It was our trips to Japan and the US that changed our minds at the last minute. We are confident we have made the right decision". But it is clear that the decision could easily have gone the other way, in favour of *Sprinter*, if Sony had shown as much interest selling as Du Pont/Otari.

Final tweaking of the PAL TMD system by Otari involves tricks like doctoring the signal fed to the mirror master recorder, for depth multiplex Hi-Fi stereo. The master tape must be equalized, with lift and boost across the audio and video spectrum, to create a contact copy which has a linear relationship between high and low frequencies.

Initially it was assumed that no sandwich process could transfer a Hi-Fi, depth multiplex recording because the original is a two-layer recording laid down by two separate sets of heads, one for the audio and one for the video. Both Sony and Du Pont ducked the issue and blocked questions. But then practical tests showed that the two-layer sandwich, high video frequencies near the surface and lower audio frequencies deeper down, creates a composite flux pattern at the tape surface which, when transferred by sandwich copying, can create a mimic two-layer recording on the copy tape. To be strictly accurate, the NTSC Beta Hi-Fi system as used in America does not use extra heads, and is not true depth multiplex recording. But contact printing works with NTSC Beta Hi-Fi as well.

Fig 1 shows how a master tape with high frequency video signals recorded near the surface and lower frequency audio recorded deeper into the oxide layer transfers a mirror image signal pattern when copied by the TMD contact process. There is every reason to suppose that there is a similar two-layer mirror image transfer with *Sprinter*.

It is no secret that tape companies are looking for new coating mixes which will mimic chrome, by offering low Curie point and high coercivity. So far none has been found.

The Curie point of cobalt ferric tape varies with the particular mix used by the tape company, but it can be as high as 500°C above the Curie point of chrome. This puts it well beyond the temperature at which the polyester base film for the tape is stable; a CoFe tape would be burned to cinders before it made a copy!

A cobalt ferric mix can be used for the TMD master tape, but copy quality is not as

good as you get from a metal particle master tape. But all that is theoretically required of the master tape is that it should have a much higher Curie temperature than the copy tape.

DAT duplication

The most interesting question, perhaps, is what will happen with DAT — will *Sprinter* and TMD be able to cope?

Sprinter needs a mirror master tape with a coercivity at least three times that of the copy tape. So far the practical limit for tape coercivity, of necessity using metal powder tape, is about 2,000 oersted. Even the sendust heads used in DAT recorders will saturate before they put a signal onto tape with coercivity higher than 2,000 oersted. Hence *Sprinter* will work for VHS video, where blank tape coercivity can be held down to around 600 oersted and master coercivity at 1800 oersted. The system may have difficulty with Super VHS, where blank tape coercivity is above 700 oersted. It certainly will not work with standard DAT tape, with a coercivity of around 1400 oersted. The system would need a mirror master with coercivity of over 4,000 oersted.

Instead barium ferrite (BaFe) tape, with a coercivity of 620 oersted, is used for DAT copying on a *Sprinter* system. The metal powder master tape has a coercivity of 2000 oersted. Sendust heads are mounted on a drum which rotates with the opposite gradient to the usual DAT format to create a mirror master. The mirror master and blank tapes are sandwiched by pressing them together onto a rotating drum by air under high pressure. A ferrite ring head directs a bias of 200 kHz perpendicular down onto the surface of the tape sandwich. This vertical alignment reduces the risk of de-magnetizing the mirror master.

Sony claims that one master will last around 3,000 transfers. Soft magnetic iron is used for the printing drum to help concentrate the bias field. The machine runs at around 150 times normal running speed.

The DAT standard was set to take this technology into account.

The shortest wavelength recorded on DAT tape is 0.67 microns. For normal recording the track pitch is 13.6 microns, with linear tape speed 8.15 millimetres/second and writing speed 3.13 metres/second. When low coercivity barium tape is used, the signal output at 0.67 microns is 3.5 dB lower than for normal MP tape. This would increase the error rate, so for contact printing the realtime linear tape speed is increased by 50% to 12.225 millimetres/second, which increases the track pitch by 50% to 20.4 microns. The wider track gives 3.5 dB more output signal — cancelling out the loss from using BaFe tape — but at the cost of 50% reduced playing time (80 minutes from a two hour cassette).

The other snag is that barium ferrite tape is very expensive, around \$350 per pancake reel at the moment.

As for TMD and DAT, the simple fact is that the process will not work with metal powder or metal evaporated or barium ferrite tape, because in each case the Curie point is far too high. So there is much research work in process to find a chrome formulation with high enough coercivity to use for DAT. That way DAT tapes could be duplicated at high speed by the TMD process. But the tape is not yet ready.

Whichever system duplicators buy, they must switch to the use of pancakes, tape winding and cassette loading. The duplication plant then becomes like a tape factory, with the essential need for a clean air room. Otherwise dust on the tape will cause unacceptable dropouts which even the efficient compensation built into modern domestic VCRs cannot conceal.

TapeTech is building a Class 100 area for tape. So is Fraser Peacock, for tape winding, in preparation for whatever high speed duplication system the company decides to buy. The cost is high because Class 100 limits are as tight as a CD pressing plant.

"I am pleased for someone else to be the guinea-pig so that we can wait and see whether the systems work as claimed", says David Tuckman of Fraser Peacock, repeating that he is "both happy and proud to be number two in this particular race".

Tuckman admits that 'logic' steers him towards *Sprinter*, with Sony's background of excellence. He has seen the *Sprinters* working in Holland, and he is reasonably happy with the sales pitch given him by Sony. But Tuckman admits to nagging doubts about quality, especially of the Hi-Fi sound.

"If TMD works as claimed, then it is 40% more efficient, due to the loopbin. If TMD is proven, we will commit. But, then again, there is already talk of a new generation *Sprinter*. Perhaps Sony will provide a loopbin. We will just have to wait and see".

Tuckman also has nagging worries about being locked into the use of chrome tape, available only from BASF and Agfa in Europe, which already costs around 3p more per cassette.

"You might say that from a competitive point of view, I am delighted to see other duplicators locked in when I am not", he says. "Du Pont has made no bones about the fact that it is interested in selling chrome tape, and that's why they have licensed Otari and Ikegami to make the hardware. I fear it may be the old story, selling razors cheap, to make a market for blades."

Tuckman also pinpoints another secret fear which the industry holds. The market for high speed duplication equipment is just not big enough to support two rival and incompatible systems. Both Sony and Du Pont believe they will win. But, as with VHS and Beta, one will win and the other will lose. The loser may have neither money nor enthusiasm for ongoing research and development — which will be bad news for anyone who has invested millions in the losing technology. ■■■■■

Pack up your Troubles

The entertainments industry has spawned all sorts of periphery service industries over the years, and as the world of entertainment expands and diversifies so the peripheries follow suit. Advance Finishers is one such company. It sprang into life on the back of the computer software industry and has latterly specialised in packing mainly for the music industry.

Advance Finishers was set up in November 1985 by James Burn who was later joined by Mark Bloomer (from CBS manufacturing) in October 1986. They now head up a thriving business on the industrial outskirts of Aylesbury maintaining not only regular contracts with several record companies such as RCA, Island, EMI, Magnet and Jive but also a good deal of over-capacity work from pressing and duplicating plants who would normally take care of packing in-house.

The term 'contract packing' is an all embracing one which covers a multitude of options. They manufacture nothing — it is purely and simply a collating exercise which more often than not, it seems, pays manufacturers or record companies to put out to an independent service company such as Advance. The two main reasons for going to Advance are (a) your record/cassette/CD packaging involves some out of the ordinary promotional item or print work which cannot

If there are no records in the shops there are no sales. Contract packing is one solution when you're running out of space or time. Report by Janet Angus.

be collated by machine or by the plant's usual manpower or (b) an imminent release date has to be met.

Another source of work is UK stores such as Boots, Woolworths and WH Smith who have recently been looking at shrink wrapping all their sale product to enable stocking of 'live' product on the shelf. This obviates the need for sales staff to collate the live product with record sleeve/cassette or CD case, and it seems to be the way a lot of stores are hoping to go. The product therefore requires shrink wrapping and appropriate stickering. Another method, which may well become the norm, is currently being considered by Virgin whereby a metal security tag is shrink wrapped onto the product; thus it will be impossible to leave the store with unpaid for goods.

Clam shell packaging in back form blisters

is a very popular way of displaying product in the US and may well be taken up in the UK. This method makes the product too bulky really to shoplift and is therefore a popular security measure. All these things mean work for Advance Finishers. They are essentially no different to any other packing service company except that they have specialised and built up a thorough knowledge of the industry and its quirks and requirements. Burn spotted a gap in the production chain and has built up a very profitable and busy 24-hour a day, seven days a week business.

"Most labels do not have their own packing facilities. Obviously the majors such as EMI and CBS do, but we will do their over capacity," explained Burn. "When the more specialist jobs come along such as box sets of 30,000 units — record pressing plants are not usually geared up to deal with that. If a job has lots of complicated bits and pieces they will generally prefer to use us. For example we recently did a Samantha Fox box which was packed in a cardboard box affair and stuffed with all sorts of things — makeup, posters, badges, the lot. Another recent job was a Courtney Pine box set. It's very varied work.

"Because we work round the clock we can offer excellent turnaround. A lot of work is meeting panic deadlines (it makes for an uncertain future in some ways!) — it happens



Aylesbury headquarters



Main packing area

CONTRACT PACKAGING



CD packing

all the time. The phone will ring at 4 o'clock on Friday afternoon with a job which must be done for Monday. Because we are the ultimate finishing house all the mishaps which may have happened along the line culminate with us and we are the ones who meet the deadline. We therefore need to have a vast workforce which is flexible, otherwise it would be incredibly expensive."

The skeleton full time staff consists of no less than 28 personnel, a figure which is boosted at any given time by anything between 50 and 125 part timers. "It is very difficult to organise such a large flexible workforce and I believe that has been one of the reasons for our success. It takes a long time to get trustworthy people who are prepared to work — this is the whole secret."

CD packing

Another rich source of work has recently opened up in the form of CD packaging. With the current relationship between the US dollar and the pound sterling US CD plants have been very attractive propositions for European record labels. Once manufactured the discs are shipped more often than not to the UK for packaging.

"We can pack up to 60,000 CDs a day by hand. Although there is machinery for packing CDs there is not a lot of point in us having a very expensive Illseman machine here which would sit around a lot of the time doing nothing. I believe that stopping and starting machinery like that for small runs tends to be more trouble than it is worth anyway, and since we can do quite large quantities by hand it's fine. Apart from anything else if we relied on one machine and that broke down, where would we be? Whereas my staff won't all drop dead at the same time. I hope." And, of course, when other people's machines break down Advance



Shrinkwrapping

can step in to the breach and meet their deadlines.

In addition to the physical packing, Advance are in an ideal position for sourcing the various packaging components. By now Burn is confident he knows everyone in the business in most countries in the world, and is able to locate most things at very competitive prices.

"By now we know how and where to do most things. For example, Cool Million recently put out a cassette which was packed in a cigarette box shaped packet. We organised the manufacture of the box. We are also moving towards the supplying of CD jewel boxes and cassette double library cases. If we can provide the buying power for all users obviously everyone can benefit from that. We can also supply print if requested. Generally speaking however the components are supplied by the customer. We can usually get hold of what we need. We know everyone in this country by now as well as two or three in the States and we have contacts in the Far East. Supplies are not generally a problem."

Growth

Advance Finishers' market is only noticeably affected by those market influences which affect the entire entertainments industry, ie the autumnal peak brings the busiest months of the year. The recent increase in importation of compact discs from the US has also been interesting to them but of course will be very dependent on the dollar.

Burn sees the company's growth particularly in CD in its various formats because although there are standard CD packing machines there are as yet no machines for packing the various formats.

"CD singles sometimes go into a maxi CD jewel box for example. The next thing will be getting a decent quality (printed) picture on

disc and then it will be a question of how to display that in the shops."

For this reason Burn believes there will be a lot of business in the clam shell back form blister packing area which displays the disc itself as well as the sleeve. This type of packaging is produced by a plastic welding process for which Advance is currently gearing up with three Radyne RF welding machines.

"I don't know what Woolworths will do about RF welding their product. They have recently launched a range in this format but how they choose to develop that remains to be seen. It is very popular in the States where they do like larger packaging but it is also a good anti-theft device."

Although the current media format debates are interesting to Advance, it is all pretty much academic as they will simply follow whatever formats are eventually adopted, "unless, of course, they automate it! We will continue to develop the services we offer now."

The company is set to turnover in excess



Heatshrink

of £1m this financial year, having experienced 500% growth in its second twelve month period. They must be getting something right.

"We have grown very quickly and have developed an excellent reputation within the industry. I would offer anyone our entire client list and be happy for them to ring up any one of them for a recommendation. A number of record labels deal direct with us. If they were to deal through the pressing plant we would simply be carrying some of the problems accumulated on the way. By dealing with us direct they can get an immediate response."

Advance Finishers' plans for the future include development of their own transport for which they recently acquired a fleet of vans. Although they do venture into distribution in a small way it is not an area they hope to pursue. Advance offers a specialist finishing service which they aim to preserve. Diversification can sometimes be a bad thing. The formula certainly seems to have worked so far.

Appendix

Chrome Tape for Duplication

Whether for cassette duplication or for other high-quality recording purposes, a good tape coating should give high output combined with low residual noise (wide dynamic range), should have low modulation noise, should exhibit low print-through characteristics, and should have uniform output and reliable performance.

A good consumer tape, in the sense of one that provides excellent one-off recordings by the end-user, is not necessarily a good duplicating tape. There are mechanical requirements on the part of the duplicator that are additional to those of the end-user and which may not be present in a consumer tape. These special requirements include:

- High speed tape winding;
- Fast loading;
- Very low oxide shed, since the duplicator is always using new tape which will not have been burnished by previous use;
- High consistency of performance.

Because of the exceptional importance of stability in output for duplicators, who cannot afford to be continually resetting bias and equalisation, BASF maintains centre-line reference tapes and continually monitors any batch deviation.

Magnetic materials

The main magnetic materials in use for tape formulations are:

- Ferric oxide (Fe₂O₃) — traditional and modern forms
- Magnetite (ferroso-ferric oxide) (Fe₃O₄)
- Cobalt modified iron oxide
- Chromium dioxide (CrO₂), and
- Pure iron (Fe).

Each material has its particular magnetic, geometric and processing properties, as well as associated costs.

Magnetic properties

The principal magnetic properties that affect performance are:

- Coercivity (H_c)
- Remanence (retentivity) (R)
- Switching Field Distribution (SFD)

John Fisher looks at chrome tape and chrome's use in cassette duplicating.

Coercivity and Remanence are familiar characteristics from tape specification sheets. Switching Field Distribution is, however, an important factor in choice of magnetic particle and in the tape's behaviour. Basically, it reflects the distribution of the number of particles which will switch the direction of their magnetisation at any given magnetic field strength. This distribution should be as narrow as possible. It depends on the variations in the size and orientation of particles: any practical tape will have a range of field strengths over which particles will switch their direction of magnetisation. Coercivity, Remanence and Switching Field Distribution affect the Maximum Output Level (MOL) (for 3% third harmonic distortion) and Saturation Output Level (SOL) from a tape, as well as the record current required to achieve these levels.

At low frequencies, where the wavelength is very much greater than the size of individual particles, MOL is influenced mainly by Remanence (retentivity) and coating thickness.

At high frequencies (short wavelengths), where individual particle size becomes more significant, MOL and SOL are influenced directly as functions of Remanence and

Coercivity, and inversely by switching field distribution. (These and the other functions referred to are extremely complex and not easily expressed as simple equations.)

The variation in magnetic properties of the various particle types, graded on a 1-5 basis, is shown in Table 1.

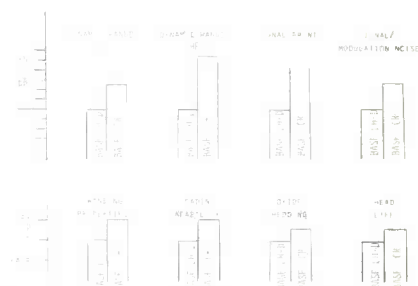


Fig 1 Overall comparison of chrome with ferric @ 120µs

Fig 1 compares the overall performance of standard BASF chrome duplicating tape (CR), when used with 120µs equalisation, with that of a good ferric duplicating tape (LH-D) by the same manufacturer.

Fig 2 plots the improvement in Maximum Twin Tone Level (MOL using two tones spaced 40 Hz apart) for these same two tapes. This test, with measurement relative to IEC reference level, compares the maximum levels for 4.7% IM products (a measure of annoyance value comparable with 3% third harmonic distortion at low frequencies). This shows the improvement in

Table 1 Magnetic Properties of Tape Coating Particles

	Iron oxide (conventional)	Iron oxide (modern)	Cobalt modified iron oxide	Chromium dioxide	Pure iron particle
Coercivity	1	2	3	3	5
Remanence (retentivity)	3	3	3	3	5
Switching Field Distribution	3	4	4	5	2

TAPE DUPLICATION

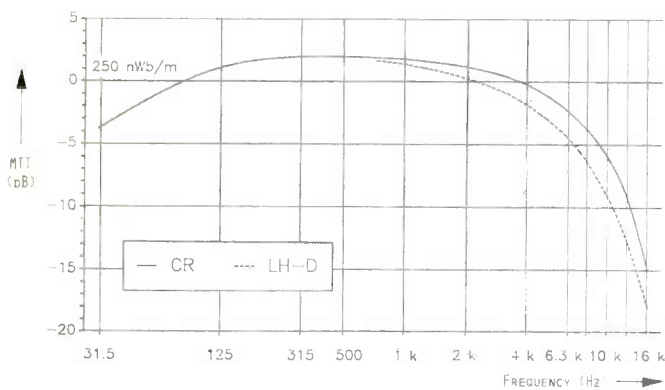


Fig 2 Comparison of Maximum Twin Tone levels for chrome and ferric

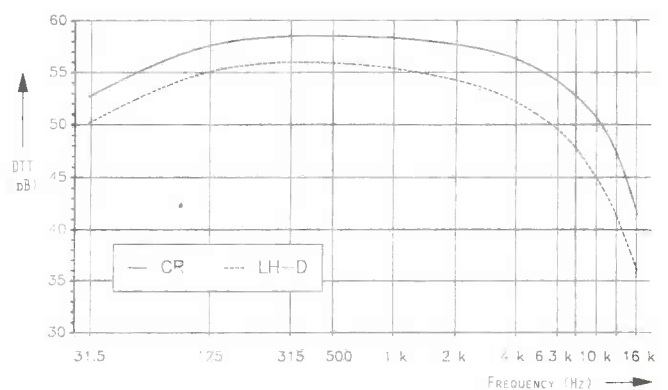


Fig 3 Comparison of Twin Tone dynamic range for chrome and ferric

high frequency output due to using chrome rather than ferric.

Because of the lower noise of the chrome tape, there is an improvement in maximum twin tone dynamic range (DTT — difference between Maximum Twin Tone Level and bias noise) at all frequencies. This is illustrated for the BASF duplicating tapes CR (chrome) and LH-D (ferric) in Fig 3. It should be borne in mind that LH-D is a good ferric tape and the comparison simply highlights the benefit of using chrome.

Geometric properties

Geometric properties of the particles in the tape coating also have a very important influence on performance. The principal properties are:

- Particle volume
- Particle shape

Particle size and remanence directly affect the residual (bias) noise of a coating.

Modulation noise is affected by the size and quantity of agglomerated particles in the tape coating, as well as surface smoothness.

Particle size is also an important factor affecting print-through, which is a function of remanence and coating thickness, and is inversely related to particle size and coercivity. The smaller crystals and agglomerations of small particles are more easily switched by weak fields. They will therefore tend to be switched by

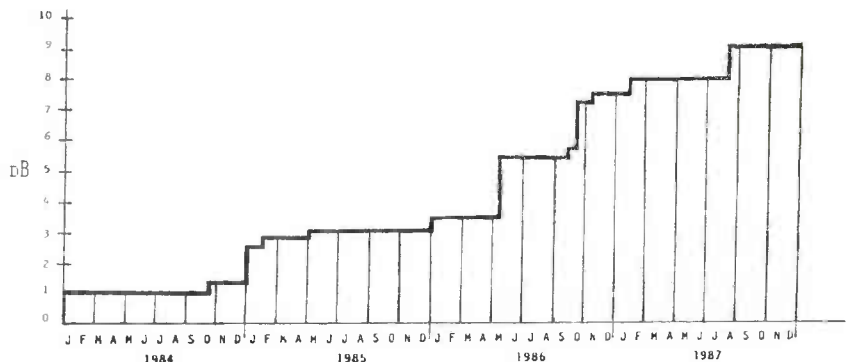


Fig 4 Improvements in chrome performance

neighbouring strong recorded fields, resulting in print. As can be seen from the accompanying electron microscope photographs Fig 5 there is a considerable variation in the 'shape' of the single particles which go to make up the oxide coating. Chrome consists of individual needle-like crystals, which are also very regular in size.

Processing (milling) characteristics

The processing characteristics of the

particles are also important, both in determining the quality of the final coating and the economics of production. The important characteristics are:

- Tendency to agglomerate
- Surface smoothness
- Milling time

Fig 6 compares particle size distributions, after dispersion, for ferric and chrome pigments. The lower left-hand chrome curve represents the improved composition of the latest BASF chrome coatings, containing



Conventional ferric oxide, single particles, showing agglomeration of needles and amorphous oxide

Modern ferric oxide, single particles, showing better structure

Pure iron, single particles

Chromium dioxide coating, single particles, showing needle-like structure

New BASF CR chromium dioxide duplication tape pigment, single particles, showing improved crystalline form and regularity of size ($\times 50,000$ magnification shown)

Fig 5 Particle size and distribution

TAPE DUPLICATION

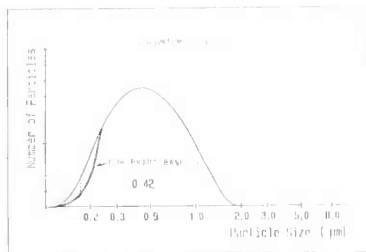
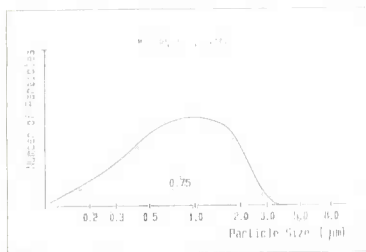
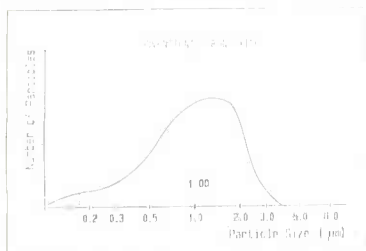


Fig 6 Particle size distribution for chrome and ferric tape

many fewer fragmented particles for lower print-through.

The regular crystal size and shape of chromium dioxide aids good surface finish. A typical pure metal pigment requires longer milling than a typical chromium dioxide pigment to achieve the required particle size distribution.

Handling

The way in which a tape winds and loads is also very important to the duplicator: many of the problems are associated with static. Chrome tape has a surface resistance 10^{-4} times that of typical ferrics and consequently gives improved loading speeds — typically approximately 30% faster overall.

The good surface regularity of chrome reduces abrasion of ferrite heads, giving

longer periods between relapping or replacement than with general iron oxide tapes.

Overall comparisons

Table 2 compares the combined magnetic, geometric and processing characteristics of the various formulations considered. Chromium dioxide and pure iron particle tapes emerge as offering the best performance on grounds of magnetic and geometric qualities. However, even more than with consumer cassettes, the high cost of pure metal tape (plus the difficulties in using it for high speed duplication) have discouraged the use of metal. The new high-MOL chrome offers further practical improvements for the future.

Table 2 Summary of Particle Characteristics by Tape Formulation

	Iron oxide (conventional)	Iron oxide (modern)	Cobalt modified iron oxide	Chromium dioxide	Pure iron particle
Magnetic properties	1	2	3	4	5
Geometric properties	2	3	3	5	3
Processing characteristics	2	3	3	5	1

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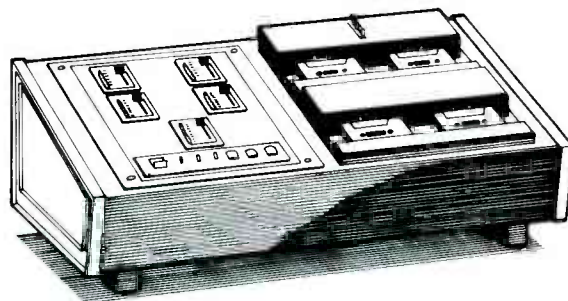
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Wax to Digital

In George Balla's own words he has been involved in the making of records from the day of wax to compact disc. "Wax to digital is a very long time in which much more technique has been developed than in the previous 100 years between Edison and the phonograph." He modestly considers himself lucky to have witnessed so much change, although Balla himself has made no small contribution to the development of the techniques we know today.

As a young man in occupied Hungary he made his first record in 1946, using a pile of broken cutting equipment which he had been left to figure out for himself. The national record company for whom he worked gave him a few old photographs and books and the rest was down to his deep seated inventiveness.

Fleeing from Hungary in 1956, (the year the Russians invaded), he found himself in South Africa (via Switzerland), totally bewildered by his new role as a 'white oppressor' having been oppressed in his native country. Speaking no English didn't help matters. There he worked for Truton Records taking the South African industry into a new age. He came to London in 1962 to work for Oriol Records, which was later bought by CBS, and there he stayed until his retirement in 1987.

That first record Balla would have preferred not to issue. The record company thought otherwise.

"I was just scratching some noise but we had to do it so that the public believed that it existed. It was horrible. The stampers were the worst — very noisy." It took him another year to get the technology back to where he knew it had been before World War II. "It was like a new born baby."

While in South Africa, coming to terms with what is a very difficult language for Eastern Europeans to master, he began to make 78rpm records for the black community. "They loved music and dancing to a wind up gramophone. But it was very difficult to make the records sound loud in that noisy environment. Another thing which didn't help was the fact that they used cheap needles in the gramophones which kept sticking. So I collected lots of record playing equipment and measured it. If you haven't got a large speaker there is a lack of bass. So therefore there is no point in putting more

George Balla is one of those rare people who have seen the industry grow from the inside. Janet Angus spoke to him recently about the development of disc cutting down through the years.

bass in the record: That would just distort the rest. So instead of using bass and bass drum I used cello and tom toms and discovered that these came through much better."

Truton gradually became more successful and started to diversify into other kinds of music. The studio and pressing plant were in the same building and Balla enjoyed a very busy few years teaching artists microphone technique, recording, editing, dubbing and cutting records. "It was a great challenge, but after a while it was not enough for me. I was young and ambitious and I wanted to come to England."

Oriol took him on a recommendation — probably one of the best decisions they ever made. His first task was to improve their equipment.

"They had at that time a relatively modern but very neglected professional Neumann cutting lathe plus two semi-amateur machines. It was a small company, how much could they afford?"

Lathe building

In rebuilding the equipment he incorporated features which only appeared on Neumann products 20 years later. He rebuilt the drive mechanism; included a device which would automatically lift the cutting head in the event of a powercut (to protect the stylus) and invented a new method of pitch variation.

"Before there were lots of gears which at that time was the fashionable design. I threw that out and put there a DC controlled feedback loop type of motor with which I was able to vary the speed with the same accuracy and evenness whether the machine was cutting at 78 or 33rpm and whether 4 grooves per inch or 600 grooves per inch. One single motor without any gears, only electronically controlled which is what today's Neumann does."

At this point they were still cutting mono records. With the CBS takeover came new investment and access to modern technology. "First I purchased the Danish Ortofon cutting machine because we were aiming that time at loud singles. Don't ask me why. It was for commercial reasons; only those records which were loud stuck out from the juke boxes. Later I put in limiters and it didn't matter, somehow it still seems to be the way that it had to be cut loud and distorted."

Commercial concerns taking priority over, and to the detriment of, audio quality is a subject close to Balla's heart. Very much a purist he claims not to enjoy listening to any music through a loudspeaker.

"My ear is waiting all the time to find fault in the recording and so I hear clicks and bangs and distortion, even from the most superior compact disc. So if I want to enjoy music I go to a concert hall where I don't mind if I hear a little bit of air conditioning noise or somebody breathing next to me; that's natural. But then I don't hear any technically created distortion. When people used to ask me my profession I always said, 'I am contributing to the noise pollution.'"

Vinyl

The worst colour for a vinyl record, according to Balla, is black. "The basic vinyl is colourless; to put in colour you have to put in paint. You can make any vivid colour with paint which has the same molecular structure as the vinyl but you cannot have deep black, aniline black — only grey. So therefore if you want to make a deep black record you must put in carbon which is much noisier than the vinyl."

In the early days of vinyl (A CBS invention) CBS conducted a survey, trying out various colours, different types of music and at different prices. "Nobody wanted anything but black. Later on colouring came back but it was used only for very cheap, very bad recordings and mainly for advertising purposes. Because some of them were really very bad recordings the public didn't take to it — that is not a proper record. To put a Beethoven symphony in pink is a matter of taste, but even with those records which were quite good, it was impossible to teach the public."

Another irritant is diameter compensation. Playing toward the centre of the record

DISC CUTTING

involves increasing loss of high frequencies. "The diameter does not allow you to make very high amplitudes because that is coinciding with the turning radius and therefore towards the centre you get less and less."

The only way to compensate is to start off with less in the first place. "Then at least the beginning and the end is the same. But the salesman says 'no, I can't afford it because I am selling the record on the first groove, and if everything is not happening and sparkling there, then nobody will buy it'. The public get used to it and they don't know that there is phenomenal loss of top toward the centre of a record."

The other problem is how far into the record you should cut. "Let's say you got 30 minutes on a side which would take up the whole playing area. Sometimes the music is such that you have only 10 minutes. If you cut the 10 minutes on the large diameter leaving a big mirror in the middle, people will return it to the shop, demanding a full record. You cannot recompose the music; it only lasts 10 minutes. So you open up the space between the grooves to fill it up. However, that means that you reach the low quality area in the centre. But you have to bow to commercial pressures."

Wax

In spite of all technological and ergonomic developments witnessed by Balla he still maintains that those fiddly days of wax cutting had their advantages.

"From a quality point of view the wax was better than the acetate, even today. But it is too tricky to handle; too clumsy, too big. Being softer, you were able to imprint the sound much better than on the slightly rubbery structure of the acetate which sticks back a bit on the cut. I suppose there is so little difference, that for the convenience of acetate, wax was dropped. But that was my inheritance from Edison whose cylinder was also wax. It also smelt better than acetate!"

"Imagine the wax was the size of a record — a little bit larger — and approximately 1 inch thick; a big pancake which you had to turn with a lathe and have the top surface up to optically mirror finish. That was a very big challenge. For a start I didn't know how they did it and there was nobody able to guide me. We reused the material, recasting it which altered the structure. It was a challenge."

Many of his techniques developed through trial and error and sometimes even by accident. Polishing the wax was done with a ruby or sapphire edged knife which has a 1/2 inch blade with a tiny 1 metre radius curvature. This had to be held so that only the middle touched the wax surface. Too deep and it was too broad, too high and it was too narrow. "I'm talking about microns. My problem was I couldn't see properly, so I put a lamp behind it inside the machine."

One day he was getting into a bit of a mess with a particular job which he abandoned for a lunch break, having switched the lamp off.

"When I came back everything was still at its previous setting, nobody had been in the room, but I find out that my knife has moved far away from the wax and then I realised that the heat from my lamp was making the wax expand and rise. So, if I want to cut a little deeper I switched on the lamp at a higher intensity. No more headaches with polished wax! Those little things are something which you cannot learn. It really was my dominant thing to find ways to solve problems, particularly at the time when you had to make your own equipment. It wasn't a big industry providing ready made equipment. You had to make your mixing console, and repair it yourself. You had to make parts yourself. That was fantastic; I loved it. Today if you have got the money you just dial a dealer and he will ship you the most sophisticated console, disc cutting machines, microphones, whatever is needed."

Lathe improvements

The first Neumann cutting lathe at CBS was the *VMS66* model. During his first few years the *VMS70* was introduced but because he had made so many modifications to their existing lathe there didn't seem much point in upgrading to it. Assuming that Neumann R&D was well underway for the next generation of cutting lathes Balla asked his colleagues to suggest things they would like to see on their ideal machine.

"Even if it was just a drum, just nonsense, I told them it doesn't matter. Even a little bell in the left hand corner to ring when you start the record — I don't care! I also gathered information from CBS laboratories and put together a list of features I thought a modern cutting machine should have."

Armed with this he set off to see Neumann in Germany. He met with a very warm reception until he began to outline his requirements. "Slowly they began to put down their pencils and the atmosphere started to freeze. What the hell's happening here I thought.

"When I had finished the president asked me how all their technical R&D had been leaked to me. 'Where did you get this information? It is exactly, in precise detail, our latest development which we are not showing to customers until our R&D is complete.' They took me to a locked room, and inside, there was the *VMS80*. Everything was there, even such details as the playback pickup should be on the left hand side; that the drive shaft should be direct DC driven motor; that the pitch motor should be direct coupled."

There was only one thing missing. Balla wanted the microscope to travel in step with the cutting head. In this way he would always be able to see what he was cutting. Also, if afterwards you were suspicious of a problem it was a simple matter of noting the cutting head position and dialling it back to examine the appropriate area which otherwise you could never find amongst the hundreds of lines.

"The microscope is on the left hand side and the cutting head on the right and they are independent. You may move the microscope half a revolution after the groove but you have to find the place yourself. I suggested a way of doing this and they said they would try. When our *VMS80* was delivered however it was not included. So I made an attachment to make the microscope travel in synchronism with the cutting head. It was like on a radio when you turn the dial, the pointer is moving with a piece of string. Well a string between the pulleys moves the microscope in the opposite direction. Simple. But that didn't look the part on a very expensive piece of machinery; it was a very amateur solution.

"A Neumann engineer came over and explained that they had tried various gearing mechanisms, sophisticated arms etc but they all caused resonances and vibrations in the machine. He told me my solution was the only one which, through the string, did not transfer any vibrations but as a manufacturer they could not offer a machine with a piece of string! So even if they agreed my patent,



Neumann VMS70

DISC CUTTING

they couldn't degrade the appearance of the machine.

"So far as I know there is only one machine in the world where the engineer has got the benefit of being able to see the grooves and even project on the video the shape of the grooves is in synchronisation with the cutting."

His other major contribution to CBS cutting lathes came a few months before he retired during a period when CBS, in common with most record companies, was being very cost conscious.

"I knew there was no money for R&D and my main function was spending money because I was involved in development and modernisation which involved capital investment. We desperately needed a VMS80 cutting machine command unit which cost between £40,000 and £50,000.

"So I decided to make one. Between the tape machine and disc cutting machine stage you can modify the sound with effects, and you can command the machine's functions etc. Quite a lot of design was based on the Neumann equipment so at minimum all those functions were included. There were quite a few extras too which, in a practical point of view, I find necessary: how to command a machine to make a certain spacing between titles, to predetermine that at that point in time you want to preopen because print echo

came in and also by carrying out all the functions remotely you can concentrate fully on any mixing or EQ because everything is in your hand. The original made by Neumann was about eight or nine feet long — a big console. My command box which incorporated everything, is in a 19 inch box. It was a challenge."

Retirement

Balla feels his retirement came at the right time. Technology has reached a stage at which he is singularly unimpressed. He draws an analogy between digital recording and fast cars. "You can have a motor car that can go at 200 miles an hour, but you haven't got the road for that, so what is the point? What do you change, the road or the car?"

"Live music is created in a huge concert hall — it could be over 100 dB. The average decent quality analogue tape recorder gives, let's say, 50 or 60 dB with some extra movement. Compact disc and digital tape recorder is 80 or 90 dB.

Okay. When you bring it home the problem is this: If you record the full dynamic which the technique allows, set your pianissimo on the threshold of hearing in your living room — when the music goes up to fortissimo you've got a court case with your neighbour!

"So even when we made analogue classical

music, quite often (not because the medium was dictating to compress), we were compressing a little bit — lifting a little of the pianissimo and pushing a little bit back the fortissimo. If you do it discreetly you've still got the effect but it is nevertheless compressed.

"In live music you have the full dynamic of the concert hall and therefore the technical aim is to reproduce that, yet when you come home it is too much. What should you do? Change the road or the car? Move into the Festival Hall for your living room?"

Another barrier to CD's success as Balla sees it is that it is competing with so many other media. The tape recorder, being invented much later than the mechanically embossed record meant that it had to fight rather than the other way round.

"The tape recorder is the forefather of the CD and so its competition existed before it was invented. The cassette is popular because it can record as well. The CD is very clever — it's a fantastic miracle, I take my hat off!" he shouts. "Technically — yes, fantastic. But you cannot record on it.

"But then, 100 years ago you could not record on the Edison cylinder — every cylinder had to be made individually. Not even pressing was possible. It was only when the cylinder turned into a flat shape that it was possible to press and mass produce it." ■

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INTERNATIONAL

Is Progress Really Our Most Important Product?

It would be nice to believe that the bad habits of the US record industry have been left behind with the passing of the '70s. It would be beautiful to believe that with the coming of the CD, the old practices of labels severely limiting returns and record stores using small shrink wrap machines to restore returned merchandise to the sales floor had been ended. Yet such practices have never completely disappeared and now appear to be on the return.

The issue at hand is the decision by some record companies to limit returns of CDs that have been damaged by customer mishandling. Although at this point this record company CD return policy has few proponents (although several other record labels are waiting in the wings), the whole issue of CD returns remains a conundrum for many record companies. Record executives today admit that the frenzied cycle of cost-reduction that surrounded the LP at the end of the 1970s probably hastened that format's current decline. Foremost amongst the savings were the tight controls on returns, coupled with loosening of the quality standards for pressing and vinyl content.

The net result of these policies was to create strong incentive for many record dealers to repackage their returns and resell them. The public faced a kind of musical incest that nobody really profited from. The consumer began to view the LP record as degraded and many analysts link this to the decline in record consumption that so devastated the industry beginning in the late 1970s. The record companies captured precious little profits from their relaxation of record quality in terms of the effect of the overall drop in record sales. Many of these returns were legitimate and the refusal of some labels to deal with returns was viewed by many dealers as simply a final extension of a cavalier attitude towards record retailers and record consumers. Not all record companies acted in this way and some

Industry consultant and analyst Martin Polon warns about tampering with the goodwill CD enjoys.

maintained a devotion to quality consistent to this day, but for some, the concept that the consumer 'could not tell the difference' became an entrenched attitude of the '70s.

The CD was born with the word 'quality' on the lips of its Dutch and Japanese parents. That sense of quality has been consistently conveyed to the recorded music consumer worldwide for the past 10 years by both the consumer audio hardware industry and by the record industry. Now the point is being raised that consumers are damaging their compact discs through careless handling. It has been conceded that many consumers are confused by past claims as to the relative indestructibility of the CD. The major record labels were themselves frequently a part of the worldwide effort to sell the new system to the public and the relative invincibility of the disc was one of the major selling points used.

During a panel discussion of the CD at a national convention of record store owners several years ago, CDs were abused with cigarette ash, sand, chunky peanut butter and mayonnaise. Although a member of the 'CD' team from a major Japanese company gritted his teeth at this demonstration (despite the violation of oriental inscrutability), the test went on. An LP was similarly abused. Of

The concept that the consumer 'could not tell the difference' became an entrenched attitude . . .

course, after washing, the CD clearly outperformed the LP. This kind of thing occurred consistently during the struggle to put the CD on the map. It seems inappropriate today to penalise the public for doing what they were told earlier was of no risk.

In fact the message about potential CD damage has been successfully transmitted to the public during the past several years. Every audio consumer magazine, every audio dealer, and the audio columnists in major newspapers and general readership magazines are quick to point out that CDs can be damaged by careless handling. That they are much less prone to damage than the LP is granted, especially in terms of freedom from degradation while being played. But this lack of a doomsday feature in the CD's design has not been emphasised significantly in recent literature. A current study into the lack of interest in automotive usage of the CD has revealed that many audiophiles fear damaging their favourite compact discs in the somewhat hostile environment of the car. That would seem to confirm the rather widespread fear of contamination and degradation of what the record consuming public tends to view as rather expensive software. The well advertised presence of sophisticated CD cleaning machinery and protective storage systems further emphasises the message that the user must be careful.

There are obviously consumers who have not gotten 'the message' about the need for care in CD handling. The audiophile market is clearly more protective of its musical software than the general public. But, the high retail price is quoted by consumers in virtually every survey conducted as the justification for exercising caution in CD handling. It seems inappropriate for the record companies to place the burden of damage directly onto the consumer or the record dealer. It just establishes a direct link

COMMENT

to the damaging practices of the past. The volume of CD returns is not that significant as to threaten the overall profitability of either the record dealer or the record label considering that the higher retail of the CD allows for some flexibility. The defence of the virtue of the CD may be worth more to the record industry than a small loss for CD returns. The obvious answer is for the record companies to mount an education campaign to make sure the public recognises the relative fragility of the CD format and the dealers understand the dangers posed by shrink wrapping returns back to virgin retail stock.

The message from all of this is that the job of creating music and duplicating music and distributing music is not finished until all of us, acting as the record industry are sure that the music sold at retail maintains the quality we have tried so hard to put into the recording and pressing process. Peer pressure must be exerted on the record companies and the record dealers to maintain the quality that the term CD has come to represent in the mind of consumers. There is a financial advantage to those companies that maintain a tight policy on returns, but that advantage is measured in decimal numbers. The cost of the public's confidence in the CD system is measured in the hundreds of millions of dollars each year. The record stores did not discover the shrink wrap

It really does not matter how much money a man has in the bank. What matters is how much his creditors think he has in the bank.

machine to offer sanitary peanut butter and jelly sandwiches to hungry customers. The record stores felt forced by difficult return policies to place questionable LP and cassette merchandise back into the cycle of retail record commerce. These policies must never be allowed to dominate distribution of the compact disc. The record retailer must be educated as to the dangers of using the shrink wrap machine as an alternative to a liberal return process by the record companies or to maintaining a 'seconds' department with lower prices though used CD pressings.

The extremely high retail price of the CD must be justified by the consumers' sense of the highest quality possible at retail. Many individuals in the record business fear the DAT as one tool to unseat the current CD pricing structure. That seems unrealistic in the short term, but certainly emphasises what many labels feel is a drastic need to retain the current level of CD profits. If the record companies see the need for such profit — so be it. We know, however, that CD

pressing can be purchased in quantities at \$1.25 per disc. There can be no excuse for any further cost cutting in CD production to pick up a penny here and a penny there. We constantly hear about new packaging systems that dispense with jewel boxes and plastic protection to save several cents and improve the rack potential. Some audio 'experts' fear that schemes to reduce the cost of pressing are stalking horses for label profits without concern for release quality. We will live and die on the quality of the product as measured only by the rather fragile and intangible consumer perception thereof.

The ultimate issue is not whether the CD is actually of the highest quality obtainable, but what the public perception of the CD really is.

A scientist who has studied technology for some time points out "that it really does not matter how much money a man has in the bank. What matters is how much money his creditors think he has in the bank. As long as they think all is well, it is. The minute they begin to distrust him, all of the money in the bank will not help as his credit rating is quickly withdrawn." The same holds true with the compact disc. "As long as the public thinks the quality is first class, it will be." It is important for us all that we work together to keep the public convinced that the CD has that innate quality the public believes in. ■

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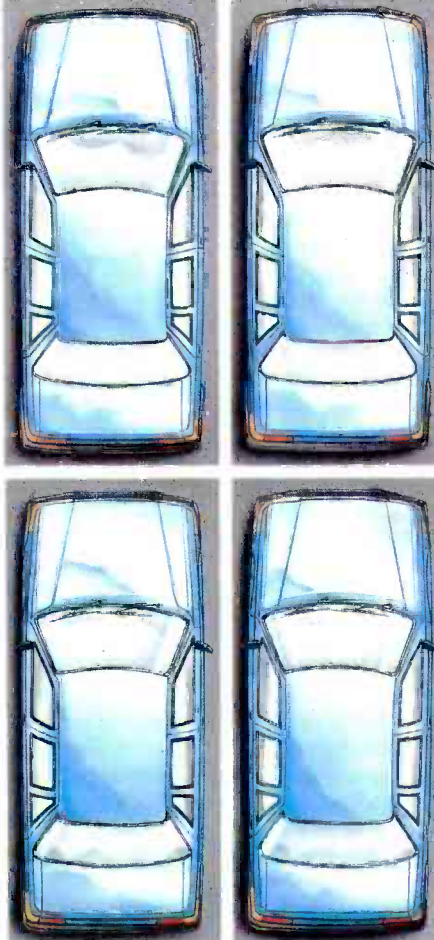
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Southwater Update

It could be argued that Disctronics' status as the leading independent CD manufacturer is down to a combination of clean living, communication, and the beautiful Bazykina Twins (of whom, more anon!). Certainly the UK plant in Sussex has undergone one immediately obvious transformation since my first visit last May: the name on the door had changed. Then it was called Disctec, but within a few months was bought by the Australian-based Disctronics Corporation. But the impact of that change, says manufacturing director Jim Johnston, has been much more than just an alteration to the signs and the headed paper.

Johnston has been there from the start, after gaining a useful grounding in laser optical technology at EMI's (then VHD, now CD) pressing facility in Swindon, Wiltshire. Given the task of setting up the Disctec operation in the agreeable surroundings of the Southwater Business Park, he is justifiably proud that its 56,000 square feet of manufacturing space had produced its first disc just 10 months after construction had started on what was a 'green field' site. One month later, in August 1986, the plant was in production — on time, and within budget.

Now, production is between 9 and 10 million CDs a year, with a capacity for 12 million, says Johnston, "if we worked flat out." Orders are a mixture of large and small with some fairly long runs (10,000 to 15,000), but the majority being between 1,000 and 2,000.

Not surprisingly, the independent labels remain the plant's biggest customers,

Peter Herring returns to Southwater to see what changes there have been now that the plant has become the UK cornerstone of the Disctronics Corporation's worldwide facility.

including Olympia which sources the majority of its masters from the vast catalogue of the Soviet Union's state recording company, Melodiya. Acclaimed by both critics and music lovers alike for offering for the first time so much new and unusual Russian music on CD, this collaboration with the USSR's foreign trade organisation, Mezhdunarodnaya Kniga has subsequently led to an even more remarkable co-venture with the Soviet Union, in the field of CD Video.

For Disctronics, it could be the start of a beautiful friendship. Says Johnston: "Melodiya are looking upon CDV as a way of introducing their music to the rest of the world. They have a lot of confidence in it and can see potential there for their own product."

One of the rewards, perhaps, of the Disctronics philosophy which Johnston describes as, "... geared to looking after the client and all his needs. We make CDs, but we could be making anything — it is service that we are concentrating all our

efforts on: not only quality, but the right quantity of discs at the right time."

His production control is designed both to look after the on-going requirements which are booked one, two, three weeks ahead or even longer, and the short-term, fast-turnround needs that many clients now have. A three or four-day turnround is not a problem.

However, a major benefit of being part of the Disctronics group is that if one plant does become overbooked, manufacture can be quickly switched to another of the four facilities. As well as Southwater, there is the original Australian plant at Braeside, near Melbourne and two in the United States — at Huntsville, Alabama, and Anaheim, California.

"We can create the 'mini-miracle' if required," smiles Johnston, "and are delighted to be able to do it." A prime example of that was the 250,000 run required in double-quick time to get a budget CD series, *The Compact Selection*, into the major outlets of leading UK high-street retailer, Boots Chemists, in time for last Christmas.

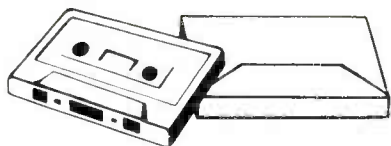
Johnston is in no doubt about the prime ingredient in this flexibility:

"We regard communications as a vital part of our set-up. It enables us to provide the kind of service we want to give."

Turning to the terminal next to his desk, he adds, "Part of the backbone is this computer which links all our manufacturing and sales units throughout the world. I can see what's happening in my own press room, as can the London sales office, and



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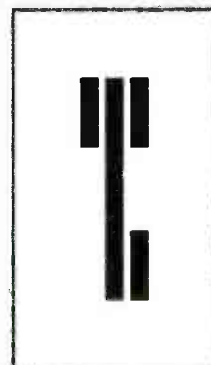
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CD MANUFACTURING

everything that's being mastered, electroformed, coated, printed, inspected, packed and delivered. It's all on the computer and we can dial up any part of the process. Our order book is in it, too, and we can see very quickly which plant can deal with an order if another is overloaded. We've devised ways of shipping glass masters and metal parts safely around the world, so transport is not a deterrent."

Was that the main benefit to come from the Australian takeover?

"The biggest advantage of becoming part of the Discronics group is that they have a forward-looking corporate strategy which encompasses the whole world. We feel we're moving into an age when providing a worldwide service will become even more important, with CDs being released instantaneously around the globe."

Although enjoying autonomy on a day-to-day basis, Southwater is in daily contact with its partners, via 'phone, facsimile or telex. Australia will answer, even if it's the middle of the night there.

"In many ways it's hard to imagine the vast distances that exist between the plants because the communications are so effective. The Melbourne plant could be down the road."

Were there plans, therefore, to enlarge Discronics' global village?

"Globally, we will expand as the market demands. We are currently engaged in a small expansion here at Southwater because we see the European market as still growing steadily, and we're fortunate that three of our plants have room to further increase capacity: we plan to double the 12 presses at Braeside and the 15 at Huntsville, and could increase our 8 presses here to 20, together with all the ancillary processes as well."

The close relationship between the Discronics operations is typified by their recent international quality conference, which set a company standard within the *Red Book* specification. The aim was to ensure that every aspect of quality had been considered by the plants and a general agreement arrived at on each one. Even non-audible visual defects were tackled because, says Johnston,

"we think it's important that the CDs we make look good." (No doubt one of the reasons why Sony's promotional CD magazine not long ago voted Southwater the best pressing plant in Europe.)

Did such co-operation preclude competitive selling and pricing between the four plants?

"To the outside world," maintains Johnston, "Discronics speaks with one voice, one quality standard — and one price. There are problems with exchange rates and so forth which we have to be on top of all the time, but there would not be an instance where discs from one source might be cheaper than those from another simply because of that."

There was no doubting Johnston's delight, though, at having stolen a march on the competition by pressing the first non-PDO commercial example of PAL CD Video. As mentioned earlier the 1 inch C-format video master had its unexpected origins in the Soviet Union and is a colourful and exuberant collage of images built around the song *Moscow Nights*, performed by the shapely sisters Bazykina. It was certainly the most spectacular of the two 'home-produced' CDVs that Discronics was able to demonstrate — the other a rather expressionless Italian pianist playing Mozart — lovely music-making, but hardly exploiting the medium, which Jim Johnston — like many others — sees as best aimed at the pop market.

"A lot depends on the way it's marketed. If it's aimed primarily at the pop market — to emulate, in some respects, the single disc — I think it can be used to promote further sales of not only CDs themselves but, later, 8 inch video discs. It's the carrot for other formats. I see it as a youth product, and a very exciting one — if it's marketed correctly. It has to be priced sufficiently low to get great volume."

Although CDV 'combi' players are expected to start out in the £500-£700 range, Johnston sees no reason why prices shouldn't follow the same downward curve as audio only CD machines have. Additionally, he believes CDV players should be available for

rental like video recorders, another 'way in' for the young user.

"I see next year as probably being a very good one for CDV, with quite a few players being sold pre-Christmas this year*. And I expect to see more and more orders coming into Discronics: we are totally committed to supporting this new format."

I was intrigued to discover what had persuaded him that CDV would succeed where LaserVision failed. There was nothing wrong with the quality of the system, he thought, it was simply that no-one had satisfactorily solved the problem of what to use it for, at least in the domestic market. With CDV, however, the much shorter programme time would be reflected in the costs:

"You're looking at a clip of, say, 4 to 5 minutes which is ideal for pop videos. Now, they're seen twice on TV then — what happens to them? The artists, I'm sure, will love to see their video clips on CDV."

It was all very well, I argued, for the CDV manufacturer to be so enthusiastic, but what about the client labels?

"I've had a very positive reaction from those I've spoken to. There is certainly a marketing job to be done: as many people as possible have to be involved and brought up-to-date as quickly as possible."

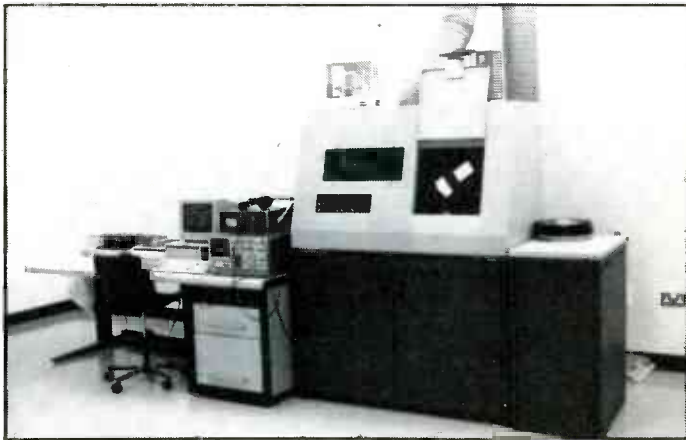
The inevitable PAL-NTSC split — the first modification to CD's universal specification — he agreed was regrettable, but thought clear marking would overcome any customer confusion. As to manufacturing, Johnston envisages few difficulties, assuming the facility is set up correctly:

"Although it's almost a tenfold increase in information over the audio CD, we're confident we can achieve the very high standards required for CDV. True, tolerances are much finer: where we would normally expect a block error rate of below 10, for CDV we're looking for below three. But we've already proved it can be done very efficiently and with very few problems."

* Our discussion took place before Philips' postponement of the Spring European launch of CDV.



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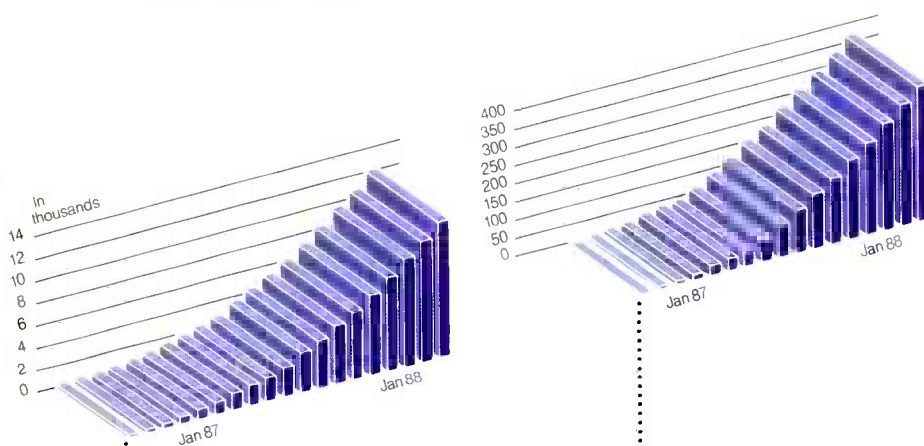
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CD MANUFACTURING

Southwater cannot master for CDV yet, but is equipped to undertake all the other processes including the 'gold finish' metallizing. Disctronics have opted for an alloy of aluminium and copper and have been able to apply it without problems. Johnston says reflectivity is very good, but the colour difference is more for the buyer's benefit.

The making of *Moscow Nights* becomes all the more remarkable when you learn that after receiving the glass master from Philips at 9.00pm, 25 sample CDVs, fully tested and checked, were being flown to the record industry's annual mid-winter show, Midem, the following afternoon. It was, says Johnston, a real team effort, involving as many of the staff as possible and, despite the constraints, those 25 CDVs represented a yield rate of 85 to 90% — virtually as good as audio CDs.

Two more orders for CDV quickly followed, including a run of 2,000.

"This plant was designed for standards beyond those required for CD alone. It was designed to enable us to process future formats — CDV, CD-ROM, and future developments which may emerge.

"We're already processing for CD-ROM and have mastered for it (but not pre-mastered). However, we're just about in a position to pre-master for an Australian CD-ROM. The CD-ROM discs we have processed here have been data checked and are right on the standard required."

In charge of mastering at Disctronics is Dave Williamson, and it was a pleasant surprise to find that the team working with him is almost entirely female, a qualified physicist and chemist among them. A standard Philips mastering system has been installed simply, "... because it's a very, clever system. It covers everything" says Williamson. "We considered others, but this was the best all-round choice."

He adds: "How it's designed, the quality of design, and the way it's thought out would

take a lot of beating, and I don't think from an operational point of view that I would want any other equipment in here. Others have tried to get on the bandwagon and fallen at the first hurdle. To consider having an open system for something as critical as photo resist coating is incredible. You're asking for trouble.

"Mastering can be a nightmare at the best of times, from the point of view of pressure. People want it yesterday, which is fair enough — that's what we're here for."

For Williamson, the two key factors in successful mastering are cleanliness and preventive maintenance and, by implication, the quality of the people involved, upon whom those factors depend.

"The equipment is very good, but if you don't keep on top of it — like even the best car — it will fall apart. A lot of people might look at but not see what's staring them in the face.

Preventive maintenance starts with facilities for analysing chemicals used, thorough cleaning of sinks and glassware to eliminate contamination and proper storage of materials such as the photo resist.

Concentrations of resist are operator-controlled, with the coated master being scanned on an X-Y plotter.

"We always go for a straight line," adds Williamson. "Anything less gets re-coated." Each master then gets its own 'route card', giving details of chemicals used, concentrations, preparation dates, and so forth, and this stays with the glass plate.

As a further check, logs are kept by each piece of equipment, recording such things as photo resist concentrations, laser intensities and relative humidities. The latter is very important, remarks Williamson, "when essentially what you're aiming to do is change that photo resist surface into a salt. And to do that it has to absorb moisture."

As far as the laser etching itself is concerned, he believes laser quality has

improved enormously over recent years. Disctronics are currently getting three months life out of each one and, when the next replacement is due, they expect their engineers to be able to carry out the alignment themselves, under Philips' supervision.

Microscope examination of a recent master revealed a well-defined pit structure and precisely parallel sides.

"Monitoring," insists Williamson, "visually inspecting every time you make a master: that's the only way to keep in touch with the system and what's happening to it. Then you should be able to instantly pick up if there's a fault developing."

For cleaning surface particles off the glass masters, he is very pleased with the system installed by British Oxygen. Each inspection desk has a point delivering 'blue dot' (medical standard) nitrogen, with a built-in de-ioniser to neutralise static. The nitrogen is filtered twice en route, and at the spray gun and, agrees Williamson:

"Filtration is expensive up front. But it's what you save at the end of the day. The water round here is fairly hard and we put it through softening and three stages of filtration, but you should never short-cut on things like that. Get it right at the front end."

His zeal for cleaning-living extends into electro-forming, where the Toolux-Alpha platers are positively (no pun intended!) sparkling:

"You could eat your dinner in there," jokes Williamson of his plating shop. "Mind you, you'd get shot if you did!"

Many visitors, he confides, are surprised to see that separation of mothers and fathers is still done by hand, expecting to see some kind of computer-controlled robot doing the job. Yet he is convinced that the unmatched — by any robot — interaction and feel provided by human touch remains the safest way of doing this.

However, the human species is also responsible for the biggest problems that Dave Williamson and his colleague, Simon Markey (in charge of tape checking) are likely to encounter. Both are critical of the quality of some incoming U-matic master tapes.

"Sometimes clients don't realise how bad their original tapes are," remarks Williamson. "The tape studios who are doing the compilations don't communicate back to them, so it's left to us to tell them."

Unlike some pressing plants, he adds, Disctronics do not simply master what they're given without question, warts and all. All source faults are relayed back to the client and cleared with him — unless already noted with the tape.

"If faults are itemised," says Markey, "it saves a lot of time. Sadly, some studios that have been in the business a long time can be slightly aloof — the 'I didn't hear it' attitude — implying of course that it's something we've done."

He tells of budget compilations which have obviously been copied off vinyl LP:



Glass master preparation

CD MANUFACTURING

"They've had to make savings, and they've made them in the source. Some seem to regard CD as just a perfect reproduction of music, whereas it's a perfect reproduction of everything — clicks, editing bumps, dropouts — all there in perfect hi-fi clarity."

Adds Williamson: "There are one or two tape studios that haven't a professional attitude to what they're doing (and I hope when they come to do CDV they approach it with more professionalism than they have the audio).

"But a lot of people don't appreciate what we're trying to do. We do all this tape checking and communication with the customer because ultimately we're trying to make the best product we can for them. It's our duty to pass on this information to them.

"It reflects on the pressing plant. Hi-fi magazines criticise pressings because it's our name round the hole in the middle, yet the problems are on the original tape. At least editing has improved with digital techniques, and it's good to see artists like Stevie Wonder and Alan Parsons committing to digital."

When I asked which studios did do a good job, there was praise for Ben Turner at Finesplice and Tape One — "both very au fait with what we need," comments Williamson. "Finesplice supply an analysis with every tape — a click here, a glitch there, a flutter here — as a matter of course and at no extra cost to the client."

In addition to tape faults, he cites PQ coding as another source of problems:

"It's really surprising how much ignorance there is of PQ coding — exactly what it's there for, and that how well you do it influences the final sound of the product. People tend to regard it as more technically complex than it is and are afraid of what they're going to do. They back off at the beginning of a track by a great deal more than is actually necessary, especially on the more awkward pieces of music where you've got a lot of crossfades."

Both Markey and Williamson feel some studios simply adopt a policy of counting 15 frames back, regardless of any other consideration.

"They maintain," says Markey, "that 15 frames is the minimum and are disbelieving when we say you can get down to two frames. Yet, I've had instances where cueing up a track by 15 frames would catch half-a-second's worth of the previous one, which is not what CD is about. You can home in so accurately on the beginning of the music that it's totally unnecessary to have that sloppy attitude."

Live recordings, he adds, are a particular problem, with PQ-ing done from, say, the beginning of the applause at the end of the previous track. So there will be several seconds of applause before the track you want to hear starts.

"We have more problems with PQ coding than anything else," explains Dave Williamson. "More than anything, that's the one thing that has to be communicated to the



Production line

customer and put right. As an 'end-user' myself, I find it very sloppy. Each gap should be listened to individually and a decision made on how many frames offset actually needs to be put on.

"It isn't 'tablets of stone': it needs some flexibility in approach. Sometimes people interpret the *Red Book* too literally."

On that other bane of CD manufacturers' lives — the notorious jewel box — Disctronics are more happy than most:

"It's improving," says Jim Johnston. "It had to improve because of packaging automation. Manufacturers of jewel boxes have had to look hard at their tooling and be a little more precise. The ones we deal with have responded magnificently and, with seemingly very little effort, have come up with jewel boxes which meet fairly tight specifications, and at a very competitive price as well."

As to the CDs themselves, Disctronics' source of polycarbonate has, thus far, been Teijin, not least because it was a proven material and they were able to fix a very competitive price based on bulk supply.

"But," adds Johnston, "I must say that recently both GE and Bayer have provided first class material which has worked very well in our system. So we now have a very good choice and besides price being an important factor, service — delivery, response time — is too. Although I should say Teijin has run trouble-free with us since we started."

Was everything so trouble-free?

"Odd problems do occur from time to time — not many, I'm pleased to say. For example, we're finding picture discs quite difficult to do. The need for four different colours, stretches the capability of the pad-printing equipment to its limits. Normally on printing we wouldn't expect more than 1 to 2% rejects."

More generally, Johnston argues:

"When you employ keen, enthusiastic, often very qualified people, they need an incentive, a target to work to. And our target is quality: producing fewer and fewer rejects. On mastering, our yield for last week was 93.85%. Figures like that bring great pride and satisfaction for talented people. Enthusiasm is vital — no matter what you're making — and we have a very good spirit here."



QC checking

Currently Southwater employs a staff of 105, working three shifts round-the-clock and 7 days a week. Alongside the electronic inspection of discs, about a dozen are employed in quality assurance.

"While our clients may take our quality for granted," believes Johnston, "we cannot. We know that it takes Herculean efforts to reach the right quality standards and a lot of hard work to stay there. We are aware of this, we accept it and we deal with it. It's constant vigilance."

A comprehensive introduction for new staff to the clean room 'rules and regulations', and an understanding of them, were vital, thought Johnston, adding:

"It requires constant 'nudging' to maintain that standard, but in the majority of cases it hasn't been a problem. People have willingly accepted that to achieve the very high standards required, absolute cleanliness is vital."

There is similar attention to costs. Although he considers the plant's energy system to be very efficient, it is nevertheless monitored very closely, with a member of staff responsible for energy conservation. Prior to his last management meeting, Johnston told all his department heads to come up with at least one way of reducing costs, including power consumption. And they all did — "minor things, but all making a contribution." Given that, was there further scope for a reduction in the price.

Not a great deal, he believed, revealing that "Over the last year, the price that we sell a disc for has been reduced by 50% or more. I think it will tend to stabilise now. There is an ongoing effort to reduce manufacturing costs, and increased use of robotics may cut some. Overall I would say we're in a good position to develop as the most efficient and lowest cost CD producer in the world. We do see that as one of our targets."

But his role at Disctronics offers much more than that for Jim Johnston:

"CD is such a beautiful object, a wonderful thing to make. Speaking as a scientist, I get a great deal of satisfaction out of CD manufacture simply because only the best goes into it: best quality materials, best quality manufacturing procedures — even the best quality water! It is these things that give us the level of perfection we're looking for."

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Magnetic Media Testing

Aerosonic Limited is based at Newtown (Drenewydd) in the Mid Wales county of Powys. The company was formed five years ago bringing together Peter Huntington (managing director) a successful businessman; James Steynor (technical director) and Richard Amey (production director) with experience in professional video electronics.

Newtown's attractions include a pleasant lifestyle amid rolling hills and the government grants associated with a development area. The company started with just two employees in a factory unit rented from Mid Wales Development (MWD). In less than five years it has been able to purchase a brand new 280 m² (3,000 ft²) factory unit in MWD's neatly landscaped St Giles Technology Park on the outskirts of Newtown, increased its staff to 18, and is now planning an expansion to 460 m² (5,000 ft²).

Technical director James Steynor had been with EMI Tape, looking at the possibility of domestic video tape manufacture and left when Thorn EMI decided to shut that line down. But the market for domestic video tape was just beginning to expand and there was clearly going to be a growing need for suitable test equipment.

At that time a major Japanese manufacturer had developed the first video tape dropout counter for VHS, but it was only available to that company's licence holders. Other major tape manufacturers were looking for a similar product so, following discussions with consultants in the magnetic media field, many of them ex-EMI colleagues, development began on what would become Aerosonic's first product: an automatic video cassette tape dropout counter.

This was before the company had been formed and, in time honoured fashion, the initial development took place in James Steynor's garage. It was based on a paper produced some five years earlier by the engineer whose work formed the basis for the Japanese dropout counter. "We took the basic techniques, refined them, and generated our own product," Steynor recalls. A prototype was assessed by a consultant who was familiar with the Japanese version then the *VCT 101* went into production.

Aerosonic specialises in the development and manufacture of test equipment to assess magnetic materials. Report by Tim Leigh Smith

This basic unit was intended for use with domestic video cassette machines (VHS, Betamax, etc) in batch testing by tape manufacturers. Two VCRs may be connected, one replaying while the other records test signals, PAL or NTSC, provided by an interal pattern generator. The unit detects replay signal loss and counts dropout exceeding preset parameters: 16, 18 or 20 dB in depth and 5, 10 or 15 μ s in duration.

As well as LED displays there is a small thermal printer built-in for hard copy of test results including the best, worst and average dropout count over a user preset period and the best and worst dropout count within a 60 second 'sliding minute' window. A record of total VCR head running time is retained in memory, along with user selected option, even when the unit is unpowered.

From the start *VCT 101* sold well and was very soon joined by an extension unit, *VCT 102*, for signal level evaluation. "We wanted to get into the market fairly quickly with a basic dropout counter, but there were definitely two needs: firstly for a dropout counter, because at that stage there was really nothing available, and secondly a complete test package for the low-budget end of the market," says James Steynor.

The *VCT 102* is linked to the basic *VCT 101* for video and audio measurements such as average RF signal level, average chroma signal level, audio noise level, and audio track sensitivity at two preselected test frequencies; with automatic calibration to avoid machine variations. The unit has internal audio and video test sources including a chroma pattern generator. Results shown on LED may also be printed via the *VCT 101*.

These two units cost around £3,200 (\$6,000) each or £6,000 (\$11,250) together,

which James Steynor describes as, "A fairly inexpensive route into a complete test system for the low-volume user." This combined package has gone to many duplication facilities and has also found a market as a research tool with tape manufacturers.

About 500 have been sold worldwide in the first five years. One of these went to NASA for testing U-matic cassettes due for use in the Space Shuttle and Skylab (avoiding astronomical charges for post and packing on return of faulty goods).

Aerosonic's second product line was a range of Vibrating Sample Magnetometer (VSM) units for assessing the magnetic properties of samples from raw materials to finished product. An electro-mechanical transducer vibrates the sample within a stable magnetic field, causing fluctuations which are picked up by sense coils, amplified using digital processing and quantified with respect to that field. The VSMs are microprocessor controlled with automatic facilities for calibration, sample centring, and various test sequences. Connection to an external computer system is via programmable RS232 serial interface.

"We've sold this type of equipment to virtually all the European tape manufacturers," says James Steynor, adding, "It's far more integrated, more of a complete package, than the equipment that we're competing against. All the electronics are our own design: we don't buy in a set processor card from anyone, everything's in-house produced to make it more efficient. We also do a lot of mechanical design work. Everything we produce is electro-mechanical, especially the VSMs."

In the past couple of years a larger version, *VSM 3001*, has been developed. This is intended more for pure research work.

Other product lines have developed from special equipment designed and constructed for major duplicators or particular manufacturers in the magnetic media industry. One example is the Void Detection Unit, *VPD 301*, transmission mode monitoring equipment which assesses coating loss (pinholes) and fluctuations in coating thickness using an infra-red source. The system is claimed to detect voids as small as

TAPE TECHNOLOGY

50 microns under suitable conditions.

Scan width and defect parameters are user definable. Results, location and nature of defects, are displayed on a 40-character LCD or presented as hard copy from a small built-in printer. Multi-processor units are available for high speed operation with high definition. Applications range from coating operations such as tape and floppy disk manufacture, to paper production.

Test transports

Aerosonic has also developed a range of microprocessor controlled transports which accept audio, video or data tapes on spools or pancakes up to 40 cm (15.75 in) diameter, with automatic control of tape speed, tape tension and pack pressure.

Options include full remote control RS232 and IEEE serial interface motorised cleaning tissue, sapphire scraping with motorised tissue, void detection, and record play testing.

The VPR 9002 is a similar transport complete with pack arm as standard and a video head assembly (PAL or NTSC) for automatic record/play evaluation of VHS tape on pancake. This started as a special development with a major tape manufacturer wanting a research tool to study new formulations without the inconvenience and expenses of loading into cassette. It is a classic example on the understanding that, once the customer is satisfied, Aerosonic will continue development for the wider market.

At first a few units were built to order for various tape manufacturers. One performed a long sequence of automatic cycles to satisfy the UK Advertising Standards Authority that a lifetime guarantee on video tape is valid. The possibility of recording several days of VHS video on one 40 cm pancake was considered for security systems. Then a major German tape manufacturer asked for 16 units with an option on four more later this year, the first ten due for delivery in early May. This order worth nearly £300,000 (\$562,500) came at just the right moment with Aerosonic poised, ready to expand, anticipating sales to duplication houses for testing pancakes prior to use on the increasing number of open reel and high speed duplicators.

James Steynor explains the advantages of pancake testing: "It's completely non-

destructive testing — you can test a pancake without destroying it. It's far quicker than testing in cassette because you don't have to load a cassette. It's also cheaper, the cost equation is such that the cost of a pancake tester is recoverable in six to nine months, and you don't introduce any vagaries through the cassette mechanism." Obviously discovering reject tape before duplication saves a great deal of time and heartache, and Steynor points out that if reject pancake goes back to the manufacturer there can be no argument that 'the problem is the way you're loading it into cassettes'.

An 8mm video tape version of the pancake tester got to the prototype stage but went on 'hold' when the market failed to develop beyond home movies. The work done on that will be carried over into a pancake tester for DAT now being developed with another major tape manufacturer. Just one of the reasons for the company's planned expansion.

Managing director Peter Huntington: "Our turnover has doubled virtually every year, and our projected increase this year is about 160%. Obviously we're not going to do that forever. It's difficult in this business to know how quickly and how far you can go. It would be easy to expand at too rapid a rate but essentially we are controlling this expansion precisely." The controlled growth in the last year included exporting to 16 countries, often through local agents in related industries. This year will see a considerable increase, with a lot of interest in Australia, China and India as well as Europe and America. Exports account for about 90% of production and the company will be entering for the Queen's Award for Export.

Spares and service are supported worldwide from Wales. For modern technology this tends to mean board replacement, and each unit is designed with items hinged or sliding on runners for ease of accessibility. "We build in extensive self-diagnostics so it can identify any faults," says James Steynor, "but like most small companies we try to make certain it doesn't go wrong in the first place." A side-effect of this policy has been that a recent offer of service contracts to existing users found new takers on the grounds that 'the unit is totally reliable'. As numbers of units in the field increase, service engineers from Newtown

will be prepared to go wherever necessary.

The expansion reflects a new emphasis on sales and marketing after the years of initial product development. Being located away from major conurbations is not seen as a problem since the vast majority of sales are abroad and many UK magnetic media manufacturers are based in Wales. The additional 180 m² factory space may come as an extension built onto the original unit or as a second unit bought from MWD. An adjacent vacant unit is already the temporary home of a test facility which is both a service and a practical demonstration of Aerosonic's products.

One surprise is that £60,000 has already been spent on equipment so that output can increase to meet anticipated orders with acceptable lead times as soon as the new space is available.

"We are entirely self-funded. It is an enviable position. We got our sums right, that's the important thing. Last year we were within 0.4% of our forecast at the start of the year. We do control it very, very tightly. We have a budget and we work to it. It allows the people doing development to get on with it, and we have taken one or two gambles which have paid off. In the electronics industry, although it's high risk, it can be high return. The way the business works is pleasing, and I think that is recognised by the people we deal with."

A willingness to offer customers what they want, combined with a preference for innovation rather than merely matching the competition, has served Aerosonic well in its first five years and should continue to do so in an expanding future as saturation of the magnetic media market reduces manufacturers' margins and makes testing more important. "You have to test throughout the process," James Steynor suggests. "The margin isn't there to test at the end and reject finished product. If the price comes to rock bottom, everyone tends to level out to the same price (I think the raw material costs are common to everyone) and then you can only sell against quality and repeatability. In their early infancy products sell because the demand is there and you can virtually sell whatever you produce. So at the start of a new product no one bothers to test, which is illogical. But when the price comes to rock bottom you have to test."



Headquarters in Wales



Main assembly



L to R JH Steynor, PK Huntington & RA Amey

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A & M

Making Music

A & M is something of an aristocrat among record labels. Although no major, it has an enviable record in spotting and nurturing talented artists both sides of the Atlantic. The result, after some 25 years in the business, is an impressive roster of names and consistent success in both album and singles charts.

If A&M has an overriding philosophy, explains head of production, Mike Todd, it is that, "We're very much a music company; that's why it was started and that's why it continues to exist."

The label was founded by musicians — in the proverbial garage, it's said — in the summer of 1962 by trumpeter Herb Alpert and his colleague Jerry Moss (the 'A' and 'M'). Essentially a vehicle for Alpert and his Tijuana Brass, it soon expanded from that limited base, becoming one of the first US labels to recognise and cultivate British talent. It signed, among others, Status Quo, Nazareth, Peter Frampton, Humble Pie, Joe Cocker and 'electric folkies' Fairport Convention. Such was the UK commitment that a subsidiary was established in London in 1972, primarily as a talent base. Artists taken on in the UK would ultimately be signed worldwide, and in the Seventies came Supertramp, The Strawbs, Rick Wakeman (his solo spell) and a brilliant singer-songwriter from Birmingham called Joan Armatrading.

At the same time, the US operation had scooped the pool with a clean-cut brother and sister duo called The Carpenters. It was during this burgeoning period in the label's history that Mike Todd joined the production team. He reflects that the one band which, although enjoying UK success, didn't make it in the 'States was Stealer's Wheel, but goes on to point out the global success of the Police.

"The UK is still very much a talent base," he confirms. "Look at Black: he broke in the

Peter Herring talks to Mike Todd about A&M's UK operation



UK in 1987, then Europe and is expanding. We've broken American acts here before they've made it in the US — Suzanne Vega is a prime example. Now Brenda Russell is breaking in the US and here."

He cites Brenda Russell as evidence of the

"Our suppliers are our suppliers because they meet our deadlines"

way A&M, always more of an album-oriented company than a singles-based one, stands by its artists: her first album was released as long ago as 1980-1. Then there was Chris de Burgh who took 12 years to break into the singles charts, despite a run of high-selling LPs.

Todd adds: "A&M was one of the first labels to look at artists in the long-term and we still stick to that philosophy. We don't believe in short-term signings."

Smiling, he goes on to comment, "The fact that we have to have records manufactured is secondary. Manufacture is an evil necessity!"

However, as any student of record quality would affirm, whatever the type of music, the one thing A&M releases have had in common over the years has been a consistently high standard of production, mastering and manufacture, in whatever format. It's only necessary to recall Glyn Johns' work with Joan Armatrading, or the state of the art Supertramp productions as irrefutable evidence of the high standards in the initial production stages.

I asked Todd how that was carried over into the manufacturing side; and if performers such as these, who obviously took a lot of trouble over the recorded sound, were concerned with quality after the master had left the recording studio?

"All of A&M's artists — and most recording artists for that matter — take a great deal of pride in the finished sound. Our philosophy is that the finished product will be the best possible, and we go to a lot of trouble to get that, whatever the sound carrier. Otherwise we would be letting our artists down. A&M set the quality standards."

As with its artists, A&M likes a long-term stability with its suppliers: a manufacturing and distribution deal with Polygram is about to be re-signed. Polygram's manufacturing commitment is to supply A&M with its vinyl

RECORD COMPANY VIEWPOINT



Cassette singles

product and, since the recent closure of Phonogram's UK pressing plant at Walthamstow that's meant sub-contracting to EMI. Could that be problematical, I asked?

"As far as we're concerned," replied Todd, "our manufacturing is with Polygram. Where they source it from is up to them. Providing they can meet the standards we require, we're happy to go along with that."

But with so much vinyl manufacture now concentrated at EMI . . .

"It's up to Polygram to ensure that the quality of pressings meets both their standards and A&M's. It's as simple as that."

Cassette and CDs are both sourced independently. MCs come from Ablex, on BASF chrome. "And," he adds, "we've no reason to change at the moment. There are various arguments about higher quality ferric tape, but for the time being we're continuing with chrome."

That prompted me to ask if the switch to EMI for vinyl also meant a change to DMM mastering. As the move to EMI had been so recent, it was a question Todd couldn't answer fully — discussions were still going on. The theory, he thought, was fine, not only technically but in terms of time-saving during the making of the metal parts.

"But we can't blithely go on to DMM. We need to see what happens in practice. DMM-mastered records can give tracking problems to some of the midi-system turntables that are on the market and we must consider that. DMM is not a cure-all, but if an artist requests it, we'll use it."

The majority of A&M's compact discs are still sourced at Nimbus, with whom the label has built up a good relationship since moving into the format. However, some orders were now being placed with Disctronics in Southwater, Sussex and with the PDO plant in Blackburn, Lancashire.

"We get good back-up from Nimbus," emphasises Todd, "and they will remain our majority supplier."

The reason for 'spreading the load' a little, he argues, is simply a matter of not wanting

to put all of A&M's eggs into one basket. Pricing played a part, but a degree of diversity was the principal motivation.

"We use manufacturers that meet our requirements in all respects — quality, supply and reliability. There's no more to be said. We want the best and we always strive for that."

Current manufacturing percentages on the three formats tended to vary with the type of music. CD could be as high as 15%, cassette 50 to 55%, yet vinyl was still commanding up to a 45% share.

"Vinyl," explains Todd, "in terms of albums, is very resilient. There are still many

"I don't think CD will necessarily displace cassette. There's an extremely high penetration of cassette hardware and the penetration of CD hardware particularly in-car, is nowhere near the level it should be."

record players around. People have a lot of records and they're generally conservative about changing. They also like the 12-by-12 package.

"Nevertheless, albums are slowly declining, if a lot slower than singles. We don't forecast when A&M will cease producing vinyl albums. We'll stop when it reaches the point where we consider it to be uneconomical. But at the moment it's still quite economic."

He accepts, though, that CD will succeed vinyl in the long-term and, because of that, the new carrier was already very important to A&M. But he goes on to say: "I don't think CD will necessarily displace cassette. There's an extremely high penetration of cassette hardware and the penetration of CD hardware, particularly in-car, is nowhere near the level it should be."

"CD will have its niche and so will cassette." And Todd echoes many others in the record industry by adding, "That infamous *'Sunday Times'* article did a lot of damage, you know."

CD's take-off these past three years, he believes, has been very successful compared to that for video at the same stage in its development.

Did he feel any loyalty to vinyl? Whereas some labels with a history of execrable pressing would no doubt be delighted to get rid of the system, A&M were held in high repute by record buyers who might hope the flow of vinyl would continue.

"A&M manufacture sound carriers which are the most suitable. We don't lead, nor do we knock a trend and, yes, the trend is that people are still buying vinyl. If people want music on vinyl, who are we to say they can't have it? We are not the kind of specialist label who can afford to ditch vinyl — the classical companies whose take-up on CD has been far higher than pop or M-O-R. If enough people want vinyl, we'll supply it — and it'll be the best quality vinyl."

Getting the right response to such trends, and getting it quickly, was the motivation behind the move of A&M's previously divided production department, some 4-5 years ago, into the label's headquarters building in London's New King's Road. They wanted the closest possible liaison between production and sales departments, a relationship Todd feels is still fairly rare in the industry.

"It was a logical step; we wanted to get rid of that 'them-and-us' attitude. I and my staff work very closely with the sales director in terms of initial manufacturing requirements. The reasoning is that, because we both work in the same office, information in terms of proposed campaigns from retailers and so forth, and information from the production side is immediate. Both sides know about it straightaway, and I think that's relatively unusual."

Meetings are kept to a minimum: there's an informal one every morning to go over the 'hot list' — the current best-selling albums and singles — and to look at stock levels and sales information from wholesalers. Instantaneous decisions are based on that.

"It's the advantage of being a small company," argues Todd. "We don't pretend to be a major. If we have a problem, we pick up a phone and discuss it."

What sort of problems did he get from his suppliers?

"Occasionally you hear of a poor quality pressing. If an artist — anyone for that matter — expresses dissatisfaction, we'll take it up. But Polygram do random checks for us both at the pressing and distribution stages, and we have our own procedures here. So there are three stages of checks. If a rogue pressing gets out, we do an immediate batch check and try to trace the source of the problem."

At A&M, all promotional samples are checked, as are any replacement 'promo'

RECORD COMPANY VIEWPOINT

copies supplied. Adds Todd:

"We insist on test cassette samples, too, before they go into manufacture. It's just to make sure the sound — given the limitations of both mediums — is as near equal to the vinyl as possible."

With vinyl, there was the occasional warpage, but, "You have to keep it in proportion, given the volume actually manufactured of any item. You may get 10 or 25 that are warped, in which case we immediately call Polygram and they will do a check. We like to have double-checks all through the system, particularly with vinyl."

Thanks to the procedure of not only listening to test MCs, but pre-production samples as well, the number of cassette failures is few and far between. CD rejects were even fewer.

I mentioned to Mike Todd that just about every record company production manager we'd spoken to had loudly cursed the CD jewel box packaging as unworthy of the product. Todd, though, was more circumspect:

"The reality you have to face with the packaging on compact discs is that the jewel box is here to stay. It's rather like the cassette library case: everyone can pick holes in it. It's been around since 1965; the Americans have tried to change it; we've tried to change it. There was a brilliant system from, I think, BASF called the 'C-Box': spring-loaded, clipped together beautifully, but it was too expensive and too late.

"The fact is that the jewel box in all its present forms — conventional and slimline — is here to stay, simply because mass-production makes it relatively economical. Any successor would have to overcome that barrier. You're talking about new packaging machinery at the manufacturing plants, new racking in the shops. To make that sort of change, you'd have to make a huge financial commitment.

There have been a lot of ideas to improve on the jewel box, but as yet nothing concrete has come anywhere near challenging it."

On the printing side of the 'packaging' operation, A&M source and supply their own paper parts. Suppliers include CMCS and Sleeveprint, with record labels from Hannibal's and TRL, and cassette inlays from the latter, too. CD booklets come from Ecran, with whom A&M have had a long working history.

"Our printing has to be spread around, explains Todd. "You can give your printer too many reprint jobs, too many new releases, and suddenly he's only got so much capacity. So we spread the load. Then, if an item takes off, if it becomes chart material, we can go to someone who's well able to cope."

Could he rely on getting the right response to sudden 'take-off' from all his suppliers?

"There are constraints on the manufacturing side. In the record industry, the take-up on initial orders is probably one of the fastest there is. We — and they — have

"If CDV is to take off, then it has to be with the consensus of the whole industry."

to react on a Monday to a chart position. They also have to take these sort of things into account, but our relationship with our suppliers is very much based on mutual trust, plus some give and take. If there's a problem, we sit and talk it out with them."

On the subject of on-time deliveries, he simply adds:

"Our suppliers are our suppliers because they meet our deadlines. We tend to stay with them for a long time because we build up a long-term relationship with them. They get to know the way we deal, and if they don't meet our requirements, then they're no longer an accredited A&M supplier.

"They have to be responsive to our urgent requirements: that applies to any record company. If they fail to deliver for any period of time, then inevitably we'll have to look at the position.

"When we sign a manufacturing and distribution deal, we rely on that company to produce product to the highest quality possible. We tell them of any lapses, but by-and-large we don't have major problems."

Apart from the day-to-day production role, it is also Mike Todd's job to keep an eye on future trends, although — again emphasising A&M's function as a music company — he comments:

"We are not necessarily innovators. We will go with the sound carrier that meets the public demand. That might seem a very blithe, catch-all phrase, but it sums it all up. If, in 20 or 25 years time, we are still producing music, then it will be on the relevant sound carrier, be it CD, MC, CD-Video, or even DAT."

How important were the last two formats to A&M now?

"From my point-of-view, I await CDV with interest. Should it take off, should the demand be there, we'll meet it.

"But before we dive into CDV, we really have to make sure that we're committing in the right way. If CDV is to take off, then it has to be with the consensus of the whole industry. And there has to be an industry back-up for it — that also goes for the hardware. There has to be promotion and consumer acceptance.

"But, at the moment, the industry is confused and the public know very little about the system."

He counters any suggestion that Polygram might put pressure on A&M to dive into CDV, adding:

"Our philosophy is that when we're ready to go into CDV, we will approach them and not before then. If we're not ready, there's no point in them coming to us.

"I think we have to wait until CDV is launched and the hardware is in the shops to support it. Then the industry can look at CDV and start making plans."

And on DAT, Todd is also prepared to wait until the opposing factions resolve their well-publicised differences. He confirms that A&M have yet to conduct any trials with the medium.

However, of considerable current interest to the label is the CD single — and the cassette single. Todd believes the former is now "... at the crossroads".

He elaborates: "You have the 5 inch single and you have the 3 inch, and if you look at the way the pendulum is swinging, a concerted effort is being made to promote the 3 inch CD single. Philips — not unnaturally — want the 5 inch to succeed and we're watching developments very closely. We did a 'flyer' when we test-marketed a 3 inch in October of last year — the Sting single — and it was very successful.

"The hurdle to be overcome is making sure the adaptor is readily available. It isn't so far, but Sony are putting quite a bit of push behind it. We haven't released any further 3 inch singles; they've all been 5 inch, and we don't have any problems selling them.

"But the real test is yet to come: CD singles aren't exactly a novelty now, but at the same time there isn't the same pressure on them as there is on the 7 inch single, whose demise I think we are witnessing for all sorts of reasons."

Todd believes the proliferation of 7 and 12 inch singles, remixes and, now, CD singles is too confusing. A process of natural selection is taking place and eventually the 7 inch will die, although he wouldn't like to estimate when:

"It's slowing down considerably, but there are a lot of other factors to be taken into consideration. The CD single is an alternative, but then so may be the cassette single, which is beginning to gain ground in America."

He adds, darkly, "Possibly another effort will be made to launch it in the UK."

Considering the packaging and the 'clockworks' involved, could the cassette single really be viable, given the price that would have to be charged?

"You have to look at it in its own right. It's not merely a question of putting a C-0 in a conventional library case — I think that was the first mistake everybody made. You have to make the cassette single *look* like a single, and I think we actually managed that.

"If you're looking for an alternative to replace the 7 inch, what has the highest penetration of household in Britain? Cassette players.

"In general, we look at all the new ideas on the market, and when we see there is sufficient take-up, then we'll respond to them. It's my job to make sure we've the suppliers who can deal with the demands we place on them. Whatever the sound carriers, A&M's intention is to carry on as we have over the past 25 years, releasing what we consider to be good music. That's what's given us our pedigree, and that's the reason why we continue to operate and succeed." ■

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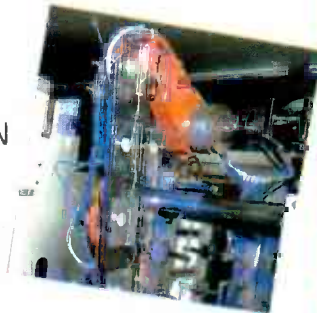
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