SONY

SONY PUTS THE PEDAL TO THE METAL WITH AME TAPE

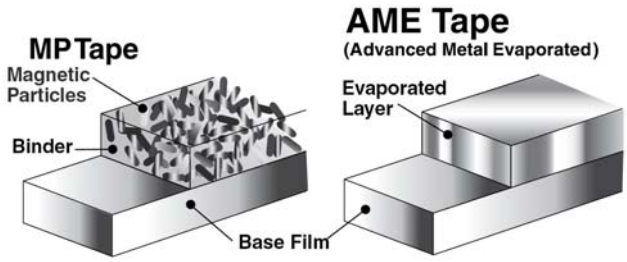
Sony Advanced Metal Evaporated Technology Offers Higher Performance and Greater Capabilities for Consumer and Professional Data and Video Recording

Sony and magnetic recording media are synonymous. In 1950, the company marketed the first magnetic recording tape in Japan – called the Soni-Tape KA series – using paper based tape. More than 50 years later, Sony's Advanced Metal Evaporated (AME) technology is setting new standards in data recording. AME tape's ability to offer the highest digital recording quality coupled with large amounts of data storage and small cassette sizes has propelled its growth dramatically in both the professional and consumer marketplaces.

Sony introduced Metal Evaporated (ME) tape, the forerunner to AME tape, in 1989. It was first used in Sony Hi8 format video recording. Over the years, Sony has made improvements to the original ME tape that led to the introduction of the first-generation AME tapes in 1996 for data and video storage. A departure from traditional media formulation, the evaporated metal technique was a breakthrough in increasing the capacity and durability of consumer and professional tape products.

AME: A Different Tape Paradigm

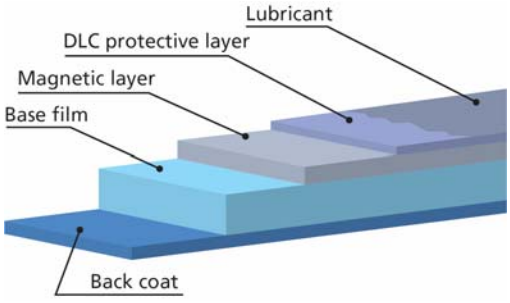
Conventional tape has a liquid magnetic layer that is applied to the base film with a glue-like binder. The result is that only about 40 percent to 50 percent of the coating is active magnetic material. By contrast, the AME process uses a high-energy electron beam gun to vaporize pure magnetic cobalt metal in a vacuum chamber. This evaporated metal deposits directly on the base film without the need for an adhesive binder, creating a coating that is virtually 100 percent active magnetic material. Without the binder, AME tapes are thinner than those using older technologies, meaning more tape can fit into each cartridge. This is one reason that cartridges of AME tape can hold so much recorded information.



According to Tom Murai, director of marketing for Sony Electronics' Media and Application Solutions Division, "With AME, even the orientation angle on the individual evaporated metal particles is optimized to get the maximum transfer of energy into the magnetic layer and to get the maximum signal out of the media. When you look at the physics of how AME tape is made and how it works together with the recording equipment, it's actually as close as you can get to a perfect recording media as far as magnetic energy transfer is concerned – retaining that energy and playing it back."

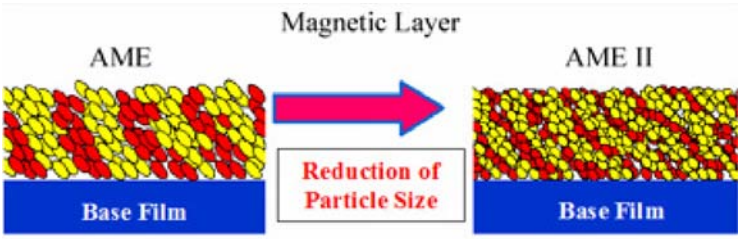
Essentially, it all comes down to the wavelength being written to the tape. The goal is to get that wavelength as short as possible because the shorter the data interval, the more information the media can hold. And that's what AME makes possible. It's tape that can record an extremely short wavelength, but yet have enough energy to read a healthy signal off the tape.

Part of the ability to read this signal comes from the use of pure cobalt magnetic material instead of performance-sapping nickel alloys of earlier ME tape. Also, Sony uses a topcoating process called Diamond-Like Carbon (DLC). In the DLC coating process, the metal magnetic layer is protected with a very thin, flexible, crystallized carbon layer. This DLC layer is about 20 times harder than metal oxides (the material normally used to make grinding wheels) and on top of the smooth metal layer, makes the top surface even smoother. Together, the hardness and the smoothness of the DLC coating dramatically improves the tape durability and abrasion resistance, reduces the need for periodic cleaning, and increases the life of the drive recording heads.



AME II: The Next Generation
In 2004, Sony improved the extraordinary areal density and durability characteristics of AME media with second-generation technology, aptly named AME II. AME II improves upon AME with a new evaporation method for applying the magnetic layer to the tape, a smoother DLC layer, and a newly developed lubricant for stable drive operation.

With AME II, the magnetic layer is evaporated and then oxidized onto the tape base. This brings out the magnetic layer's maximum potential by reducing the size of its metal particles. This, in turn, creates a much smoother tape surface and allows the spacing between the magnet head and magnetic layer to be minimized.



AME Delivers Data Storage Benefits
AME's combination of wear resistance and smoothness is ideal for recording tape; it resists wear and shredding, making the tapes and heads last longer, and requires cleaning less often, if at all. Drop-outs are minimized, and the tapes give superb durability and archival stability while producing higher playback signal output levels than metal particle tape. This is one of the reasons Sony's AME technology is at the heart of Advanced Intelligent Tape (AIT) digital data storage systems. These systems were designed to achieve the maximum user benefits of AME: compact size, high capacity and exceptional durability.

Sony introduced the AIT-1 format in 1996. These tapes were introduced with a 25GB native storage capacity (which was later increased to 35GB in 1999) in an 8mm cartridge, not only holding a large amount of information in a small form-factor, but also offering unparalleled performance in many areas. One key feature of the AIT format that helped realize the potential of AME tape was the inclusion of a memory chip in the cassette, called Memory-In-Cassette (MIC), which could be read instantly by the AIT drive. This chip held the ID number of the cassette, file directory and other performance information, enabling proactive storage management and speeding access times, among other things.

Since 1996, Sony has introduced four more generations of AIT – AIT-2, AIT-3, AIT-3Ex and AIT-4. To address the need for low cost, entry level solutions while providing high-end features and benefits, Sony made enhancements to the AIT-1 and AIT-2 formats and in 2004 introduced the new products under the AIT Turbo line. The result, AIT provides the most complete range of capacities, performance, and price points, from low-end to enterprise. AIT-5 is scheduled to begin shipping in early Q4 2006 which will further expand the range offered by the AIT format.

Sony has also added Write Once Read Many (WORM) functionality as a standard feature in AIT-2, AIT-2 Turbo, AIT-3, and AIT-4 drives. This adds an additional layer of data integrity to Sony cartridges, helping companies meet compliance guidelines for a myriad of mandates, including Sarbanes-Oxley, SEC Rule 17a-4 and HIPAA. WORM support on AIT-5 is expected to be available beginning Spring 2007.

	AIT-E Turbo	AIT-1 Turbo	AIT-2 Turbo	AIT-3	AIT-3Ex	AIT-4	AIT-5
Native Capacity	20GB	40GB	80GB	100GB	150GB	200GB	400GB
Transfer Rate	6MB/s	6MB/s	12MB/s	12MB/S	18MB/s	24MB/s	24MB/s
WORM Support	No	No	Yes	Yes	No	Yes	Yes*

* WORM support on AIT-5 is expected to be available beginning Spring 2007

Due to these significant advantages, Exabyte also exclusively uses the AME media formulation for the Mammoth and VXA data storage formats.

Increased American Production for AIT

To meet the increasing market demands for Sony's AIT data storage media, Sony Magnetic Products of America (SMPA), a manufacturing unit of Sony Electronics Inc., invested $34 million in 1999 to increase AME tape production capacity at its Dothan, Alabama, facility. Sony's total investment today is over $51.0 million. The first shipment of AIT-2 tape from SMPA took place in July 2001 as part of a major expansion effort to meet the growing demand of high-capacity metal/digital tape products. The Dothan facility is currently shipping AIT-E Turbo, AIT-1, AIT-1 Turbo, AIT-2 and AIT-3 media. AIT-2 Turbo, AIT-3Ex and AIT-4 media are solely produced in Japan at this time.

"Increasing production in the United States helps us offer our customers the expanded distribution needed to address the growing market demand," said Murai. "Sony anticipates a continuing growth in the AME media market as the acceptance and embedded base of AIT and systems grow."

Expanding the AIT production capacity in the United States is a natural expansion of the Dothan facility. This startup will result in shorter lead times to ensure faster delivery to customers and greater overall production flexibility. The Dothan facility produces data storage products, consumer and professional videotape and audio tape.

Making the Most of Video Applications

In addition to being used in AIT, Mammoth, and VXA data recording applications, AME is employed to produce tapes for Sony's DVCAM professional format and DV consumer video systems. AME was originally developed for use in Hi8 video applications and is now used for the 8mm DARS (digital professional audio), Digital Mini DV (digital consumer video) and DVCAM (digital professional video) formats. Since AME technology permits the recording of a very high frequency signal and enjoys the associated benefit of a very small cassette, it is popular in both professional and consumer formats.

Consumer acceptance of DV, with its AME tape, has been dramatic. Sony estimates that the total U.S. DV tape market will continue to grow as the ability of home users to capture, edit, send and share their creations is made even easier and less costly. End users can transfer digital video from DVCAM or a DV camera, edit, store it as an MPEG file and e-mail it to anyone. And, because it's digital, there is virtually no degradation of quality between generations.

Durability, extremely low head wear and cost-effectiveness are all qualities that AME offers in meeting the demanding needs of professional users. Because DVCAM tapes can be used in harsh environments with multiple edits and field production editing, it was specifically engineered with the professional user in mind. It is designed to withstand these rigors with its DLC protective layer over the magnetic layer, ensuring professional-level durability and a specially treated base film to preserve tracking integrity, while its 16Kb chip (when used with compatible hardware) makes locating material on the tape fast and easy. DVCAM tape also boasts lower error and dropout rates and more consistent physical characteristics than the Mini DV tape.

The DVCAM format captures up to three hours of digital component video on a standard cassette not much larger than an 8mm videotape. It calls for high bandwidth and narrow track width. Meeting both of these targets – without compromising reliability – necessitates a high output tape, a demand met by AME. Combined, these factors result in a powerful package for the user.

Conclusion

From broadcast to production event videography to streaming media, the benefits of AME have been widely embraced as shown by the rapid growth of formats that span consumer, professional and data storage. AME has been vital in achieving the capacity and reliability achievements in the AIT format and is critical in providing the ability to continue to increase capacity – achieving 800GB of native capacity per 8mm cartridge before the end of the decade.