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Array's sliding background electrode attracts new customers although more time is needed for development

- **Epson in Japan signs evaluation agreement worth SEK 2.5 million.**
- **Matsushita chooses the new sliding background electrode and decides to delay decision on productification for three to six months.**
- **TonerJet is considered to have major competitive potential relative to laser and inkjet as confirmed by the agreements with FujiXerox and Epson.**

Print quality is critical

All printer manufacturers are investing significant resources in the search for a winning color print technology for offices. The fact that color machines currently account for only 5% of global market sales of laser printers indicates that no technology has yet to succeed.

Improvements in print speed and price for laser printers have taken longer than expected. At the same time, continuous developments have gradually raised the minimum requirements for marketable print quality.

The performance and cost potential of TonerJet is attracting manufacturers of both laser and inkjet printers. For TonerJet to become a dominant print technology in offices of the future, however, its print quality must also live up to market standards. To date, this has been possible in a controlled laboratory environment.

TonerJet is based on a patented principle in which pigment particles are shot through microscopic holes in a printed circuit board. The pigment strikes a background electrode and forms dots. In the final stage, the print is transferred to a sheet of paper using conventional technology.

Demand for high-resolution printouts requires that three dots on the same horizontal line are shot from the same hole. Since 1997, Array and its licensees have applied a method that electrostatically deflects the placement of the dots horizontally on the paper, called Dot Deflection Control (DDC). Electrostatic fields are affected by humidity in the air and the distance to nearby metals. As a result, TonerJet with DDC is sensitive to climate changes and manufacturing tolerances, which can cause discernible striping on printouts.



Sufficient precision in the horizontal placement of the dots has been achieved with DDC under controlled forms. During the work to develop TonerJet for mass production of office products it has proven necessary, however, to measure and adjust for variations in humidity. It is also important that a mass-produced print head with DDC can be manufactured with high mechanical precision. To date, these complications have hindered TonerJet from entering the next product development stage.

Sliding background electrode raises print quality

Consequently, work was begun in the summer of 1999 on an alternative mechanical principle, called Multi Interlaced Control (MIC), whereby the dots are shot straight ahead onto the rotating background electrode rather than deflected electrostatically. The electrode, which rotates several revolutions per page, shifts sideways so that the dots are placed beside each other on the same horizontal line with a high degree of precision. Like DDC, the MIC principle is a direct print technology, which means that all colors can be printed at the same time at high speed.

Besides eliminating the tendency to the striping associated with DDC, MIC, as the name implies, offers Interlacing, a technique that ensures that any two neighboring dots on the paper are not generated from the same hole. Interlacing is considered the biggest secret behind the high print quality of inkjet printers.

After comprehensive tests during the winter, a prototype was built by Array during the spring of 2000. At the same time, Matsushita was offered unlimited access to the MIC project. In June 2000, Matsushita announced that it intended to delay any decision on its first TonerJet product until October 2000, in part to facilitate a further evaluation of MIC.

A number of patents have been applied for regarding the MIC principle. Together with other patents that have been applied for and granted in recent years, the patent protection on TonerJet is considered strong and long-term.

New customers show confidence in TonerJet

MIC has now demonstrated significantly better print quality and lower sensitivity to climate changes and manufacturing tolerances. New print tests with the MIC prototype have been conducted and shown to customers in Japan. Based on these tests and the performance and cost structure that TonerJet offers, Epson has now signed an agreement to evaluate TonerJet, following by one month a similar agreement with FujiXerox. Epson, a market leader in inkjet printers, is looking for a faster print technology. The agreement generates SEK 2.5 million in revenue for Array. It is Array's hope that both Epson's and FujiXerox's evaluations will lead to licensing agreements next year.

Matsushita needs more time

Although Matsushita plans to use MIC in its future products, it has announced that it will not make a final decision for three to six months. Since all the technical issues have not been



resolved, Matsushita's TonerJet project has not progressed to the next product development stage, as expected. A timetable for productification will not be finalized until a decision on the next stage is made. Pending this decision, Array, until further notice, will not speculate on potential timetables. Array's ultimate objective is to fully develop the MIC concept as soon as possible in order to facilitate a productification decision. Matsushita is pursuing its TonerJet project on a full scale with the express objective of launching products as quickly as possible. With their licensing and patent agreement as a foundation, Array and Matsushita will continue their cooperation.

TonerJet's business potential unaffected

Sales of color laser printers for offices are rising by 50% a year, exceeding previous forecasts, despite that no technology as yet offers the right color price/performance to seriously compete with the monochrome alternatives. TonerJet is considered by Matsushita, FujiXerox and Epson to be one of the most promising technologies to potentially do so.

The global market for laser printers in 2000 is estimated at SEK 160 billion at the end user level. Management is convinced that the large part of this market, as with inkjet printers, will convert to color. Array's goal is to make TonerJet one of the three dominant print technologies for offices of the future. In terms of numbers, this could mean annual royalties of SEK 600 million on a market share of 25% which does not include the copier market or possible revenue from supplies, e.g. royalties on toner cassettes.

Financing

Array's objective is to sign two licensing agreements, each worth approximately SEK 40 million, in 2001. This would allow it to strike a balance between income and expenses in 2001. Given its current level of ambition, the company's cash reserves will cover continued development until June 2001. Revenues from new partners are therefore necessary for Array to continue its operations at their current level without further contributions of capital.

In summary, it can be stated that TonerJet has not yet fulfilled the stringent requirements that today's manufacturers of printer products make in order to adopt a new product and allocate substantial investments for production preparations and tools. The board of directors and management of Array collectively feel, however, that recent technical and commercial progress is likely to lead to the signing of one or more new licenses in 2001 and that one or more product decisions will be made in 2001.