Flex Circuit news

July 1999

Smartflex and ADFlex Sold!!!

ADFlex Solutions has agreed to be purchased by Innovex for $3.80 per share, and Smartflex Systems has agreed to be purchased by Saturn Electronics & Engineering for $10.50 per share.

The Innovex/ADFlex merger seems to be a very good fit. Innovex's main market is suspension flex circuits for the disk drive industry, and ADFlex's major market is actuator flex circuits for the disk drive industry. ADFlex announced that they had earned a small operating profit in the second quarter, excluding the restructuring charges announced in April. Sales for the second quarter increased 20% over the first quarter.

Details on the merger can be found in the SC 14D9 filling with the SEC. Use this link http://www.freeedgar.com/...

Throughout *The Flex Circuit News* there are links to the web pages of those companies or individuals mentioned in the articles, as well as links to advertisers web pages. Look for the pointing finger.

Microns, Mountains & Miller Moths

IPC Flex Conference in Denver

Tom Woznicki

Almost 200 engineers, flex manufacturers, material suppliers and other industry folks gathered at the Holiday Inn at Denver International Airport to attend the Fifth Annual IPC Conference on Flexible Circuitry.

In this article I will review four papers presented on the first day of the conference. In future issues I will share more of the useful information I learned from the other papers presented. Big thanks to the IPC for allowing selections from the conference proceedings to be reprinted here in FCN.

Fine-line and Microvia Trends

Dominique Numakura and Steve Dean of Parlex presented a road map for high density flex circuits. Drawing largely on information from Techsearch, they showed that pitch for fine-line flex circuits is currently just below 100 microns with the leading edge applications using a pitch of 40 microns (25 microns = 1 mil). They also showed a trend line (see following page) showing the pitch for fine-line flex dropping to 75 microns by the year 2003, with the very leading edge applications needing a 20 micron pitch.

Continued on page two

In the left hand column under **Table of Contents** click on the link **Body: Entire Filing**. It's a long document, but if you page down to page 17 under the heading BACKGROUND: REASONS FOR RECOMMENDATION, it details the steps ADFlex went through trying to save the company.

While it was known in the industry that ADFlex was looking for a white knight to save them from bankruptcy, the swiftness of the Smartflex acquisition came as a surprise. Saturn Electronics & Engineering is a privately-held minority-owned business providing electronic and electromechanical systems. 87% of their business comes from the automotive industry. Since flex circuits and flex assemblies are becoming more and more common in automobiles, Smartflex gives them the ability to provide higher level electronic assemblies. Saturn's web page is www.saturnee.com.

The press release for the merger is available on Smartflex's web page at http://www.smartflex.com/co_news/currentpr.html.

The Flex Circuit News is a bimonthly newsletter published by Tom Woznicki and Flex Circuit Design Company in San Jose, California. It is dedicated to providing information about all aspects of and promoting the use of flexible printed circuits in interconnection and electronic packaging.

The Flex Circuit News is a free publication that is delivered to subscribers by e-mail.

To submit a story for *The Flex Circuit News*, send an abstract along with the author's credentials to: Twoznicki@AOL.com, or to the mail address below. For information on advertising in *Flex Circuit News*, contact Tom Woznicki at: Twoznicki@AOL.com or call 1.408.629.8343.

Flex Circuit Design Company is a consulting company that specializes in designing flexible printed circuits for OEMs and flex circuit manufacturers.

Got a question about flex circuits? Send it to: Twoznicki@AOL.com

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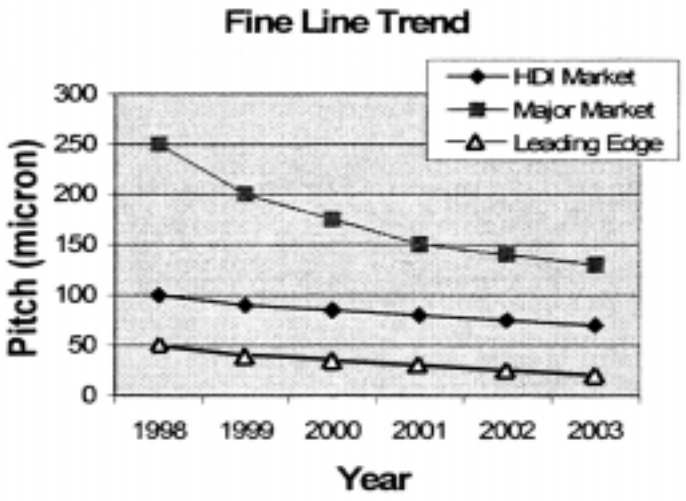
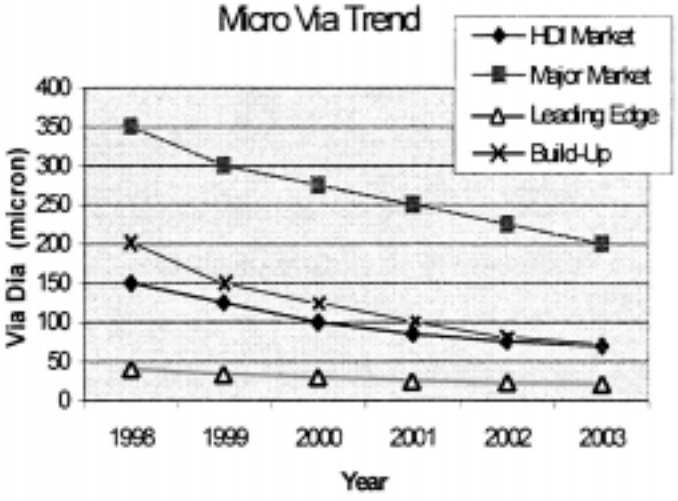
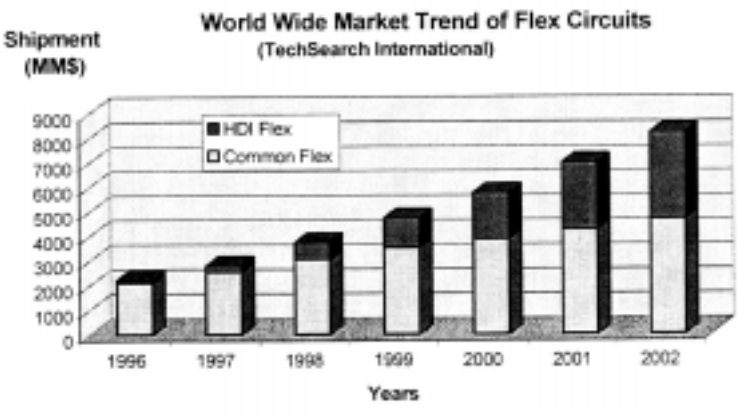




The Parlex folks also presented two graphs from TechSearch showing how via size will be shrinking and the increasing demand for fine-line flex circuitry or HDI (high density interconnect) as they like to call it. It shows that the fine-line flex circuitry will be about 40% of the total dollar volume by the year 2002. Flex manufacturers, especially prototype shops, are going to have to start preparing now to meet their customers future needs, especially in the area of microvia generation.

Following the Parlex presentation Bill Burdick from General Electric Corporate Research & Development talked about the fine-line flex circuits that they make there in their labs. They are currently making flex circuits with lines and spaces down to 25 microns. They can make these circuits with up to eight layers using multiple laminations. These circuits use lasers to make 42 micron microvias and copper layers 4 to 6 microns thick. But GE R&D doesn't want



to be in the flex circuit business. They are actively looking for sources that can meet the current and future need of the various GE divisions, particularly the medical equipment divisions.

To our valued guests,

In Colorado each year we have an infestation of Miller Moths...

This is a phenomenon that occurs on a yearly basis and there is not much that we are able to do to prevent this occurrence...

Thank you for your patience.

Holiday Inn DIA

Automotive Flex Circuits

Shaun Sheehan of Pressac, Inc. and Mark Rider of FCI Automotive gave a presentation comparing wire harnesses to flex circuits in automobiles. With more and more electronics being placed in cars, car makers are looking at flex circuits to reduce weight and improve assembly. In 1994 the average car had 65 pounds of wiring stretching over a mile in length! Flex circuitry they can reduce the weight of the wiring by 30%. Flex also reduces the time needed for installation of a typical wiring harness from 76 seconds to 60 seconds - a big difference when you are building millions of cars per year!

However, some applications in cars handle lots of current and flex circuits do not handle high current as well as round wires do. Even though the traces can be made very wide to handle many amps, the traces must narrow down at the connectors which causes hot spots. Also, according to Sheehan and Rider, there is not yet a family or industry standard for connectors to use in automotive applications. Handling must also be considered because flex circuits are more delicate than round wire harnesses. The authors conclude that while there are major benefits to using flex in automobile applications there are ma-

jor challenges to be addressed and resolved. As firms such as Pressac and FCI address these challenges, look for more and more flex circuits in the cars of the future!

New Sources for Adhesiveless Laminates

In addition to the papers I got talk to some of the material suppliers regarding low weight copper laminates. To achieve fine lines and spaces we need copper that is 4 to 6 microns thick - about 0.125 ounces for etching, as well as polyimide with a copper seed layer for additive processing.

I met with folks from Gould who gave me tons of information on their GouldFlex adhesiveless flex materials. They are producing laminates with copper thicknesses from one ounce down to 2000 angstroms using either a chromium or nickel tie coat. A week after coming home from the conference I got a call from International Flex Technology that they have come to an agreement with Gould regarding Gould's patent on using chromium as a tie coat, so IFT will once again be supplying adhesiveless laminate in addition to their fine-line additive circuits. With DuPont coming on line with adhesiveless materials later this year, there should be no availability issues for low-weight copper laminates. Gould can be reached at 602-994-8242. IFT can be reached at 607-755-3920.

Extreme Novice Snowboarding

On a personal note, I took my own suggestion and flew into Denver a day early to catch some late-season snowboarding at Arapahoe Basin. I am a **very** novice snowboarder (what do you expect from a forty-two year-old computer jockey?) but it is one of my favorite father-son things to do with my fifteen year-old son. I was really looking forward to the trip, but I was a little sad that Mike wasn't with me.

To get there I had to get up at 4:30AM on Sunday morning, which was tough because that was 3:30 AM West Coast time. When I got to the mountain I was pleasantly surprised - it was a little windy, and lightly snowing with about 3-5 inches of new snow. But on the first run down the hill I caught an edge and planted my butt in the snow and discovered that under that layer of new snow was a thick layer of solid ice! (I sat very gingerly while listening to the presentations at the conference!). But as the sun came out the ice softened and made for great boarding the rest of the day. What more can you ask for in June? I would love to come back and try Arapahoe in mid-season.

Attack of the Miller Moths

After coming home from snowboarding on Sunday, the sun was shining gloriously on the Front Range. I opened the drapes and slid open my window and - whoa! A herd of moths came stampeding out of a hole in the window frame! Just as a was reaching for the phone to call the front desk, I noticed a flyer on Holiday Inn stationary near the phone. It read:

To our valued guests,

In Colorado each year we have an infestation of Miller Moths. This normally occurs during the 2nd to 3rd week of June and lasts about 3-4 weeks.

This is a phenomenon that occurs on a yearly basis and there is not much that we are able to do to prevent this occurrence.

We will be turning off the lights the outside of the building in a effort to prevent attracting them further to our location.

We would suggest that you not leave your lights on when you leave the room, and pull your drapes all the way shut. It may also help if you leave on your bathroom light with the door cracked, this will attract them to the bathroom and hopefully away from you.

Thank you for your patience.

Holiday Inn DIA

So much for complaining to the front desk!

The Miller Moths provided some comic relief in the conference - Bill Jacobi made several bad jokes about “getting the bugs out” of his presentation.

Continued on page six

DILBERT

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Back issues of The Flex Circuit News are now available on our web page - www.flexdude.com!

Each edition of the *Flex Circuit News* contains a vintage Dilbert comic strip. Under our agreement with United Features Syndicate, we cannot include Dilbert in our archieved editions. Please be sure to subscribe to *Flex Circuit News* at: www.flexdude.com

More Chestnuts

At the conference I had a chance to meet some folks from 3M in Austin, Texas. I'm sure that you've seen their fine-line flex circuits on inkjet printer cartridges. They told me they are making some fine-line flex circuits for other applications and are looking to do more.

3M can only make single-layer circuits. They are making circuits in high volume with 65 micron pitch and are now starting programs with 55 micron pitch. They are primarily looking for high volume applications such as disk drive FOS circuits and TBGA substrates, but will entertain lower-volume, technically

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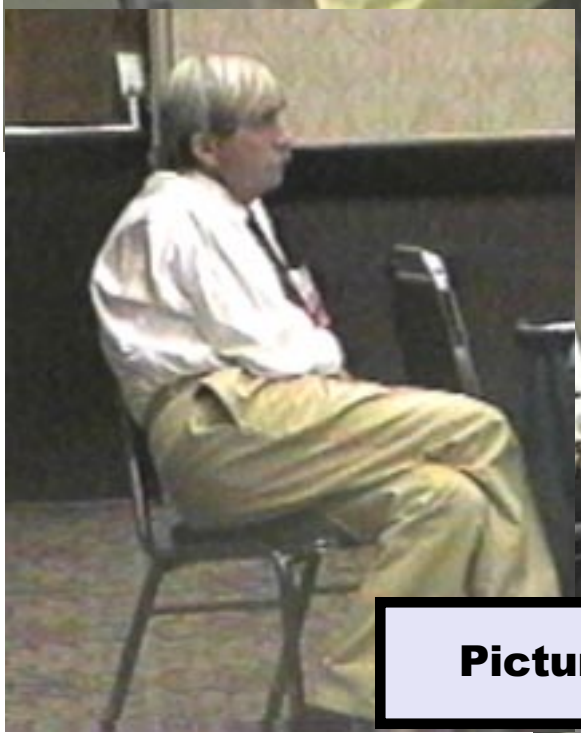


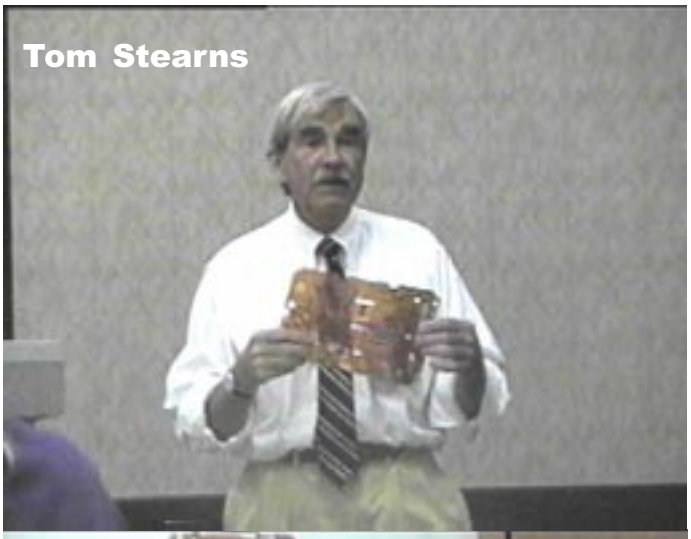
Pictures from Denver

challenging applications such as those found in medical equipment. For information contact Joe Wilkens at 512-984-6643.

The folks at Maxtor in Colorado told me about The Wytan Company, a proto assembly house in Golden, Colorado. They specialize in proto and medium-volume assemblies - up to a few thousand per month. They can do both gold wire bonding and flip chip assembly on flex circuits. Their current flip chip capability is 25 micron pitch, but they are working to get lower. The owner's name is Andy Toth. They are not on the web yet, but you can send them an e-mail at wytan@earthlink.com. Their phone number is 303-215-0905 and the fax number is 215-0902.

Continued on page eight

More Pictures from Denver



Course on Flex Design & Applications

Bill Jacobi and Tom Stearns are on the road again, this time teaching a three day course on designing and using flex circuits. This course is sponsored by the University of Wisconsin - Milwaukee.

They will be teaching this course on September 21-23, 1999 in Milpitas, California, and on October 25-27, 1999 in Andover, Massachusetts. The cost of the course is $1,025.00.

For information call the University of Wiconsin-Milwaukee and ask for Alex Wallace, program director, or Mark Schmidt, program assistant. The phone number is 414-227-3157. You can also e-mail them at awallace@uwm.edu or dschmidt@uwm.edu.