

Flex Forecast....

## Continued Growth in Flex Circuitry Projected

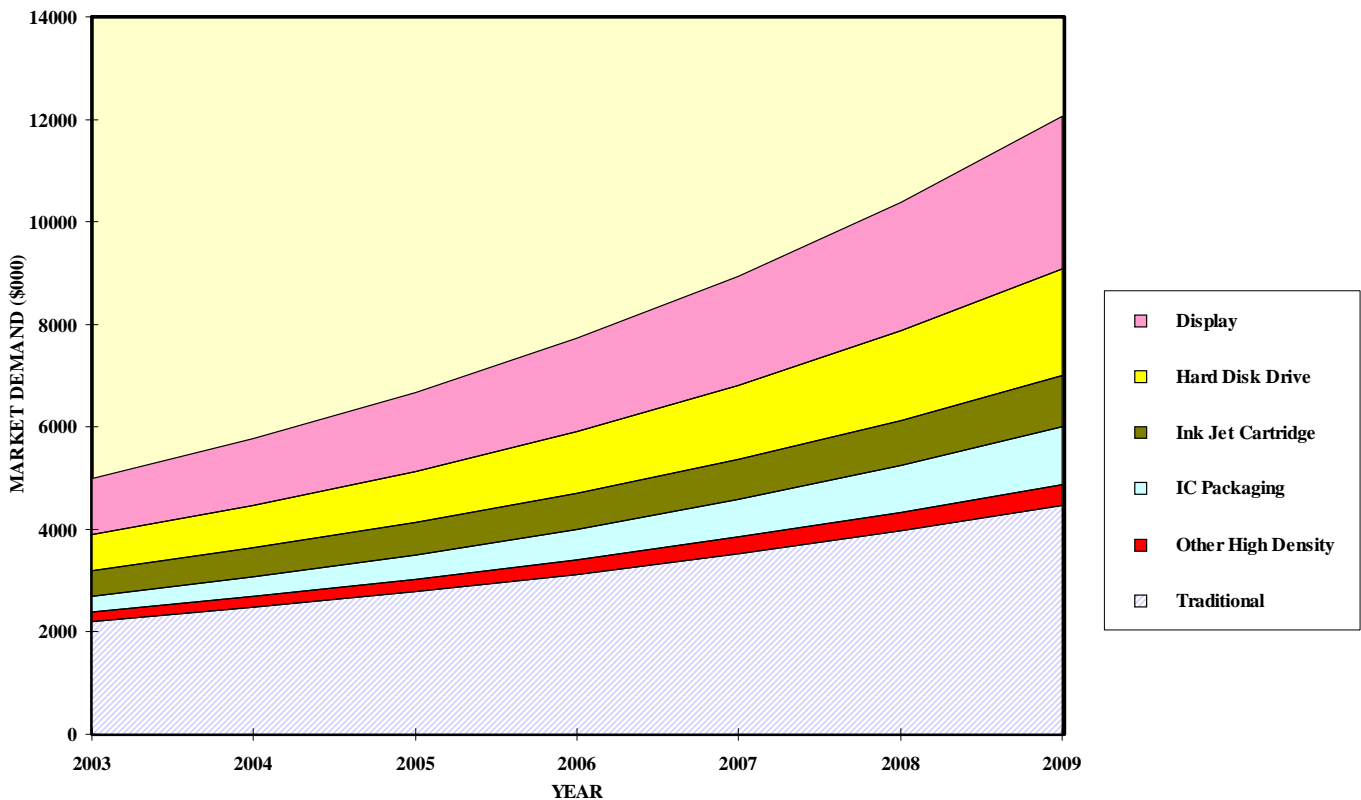
Tim Meehan, president of Eclectic Technologies and a long-time flex industry guy, has recently completed a demand forecast for the flex circuit market through 2007.

**Tom Woznicki**

Whoa - it sure looks good!

The total flexible circuit market is forecast to grow at an average annual rate exceeding 15% during the period, and it should reach a total size of over \$12 billion.

FLEXIBLE CIRCUIT MARKET DEMAND BY APPLICATION



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.



High density applications (circuit features < 75µ) are growing at an average annual rate exceeding 18%, and collectively they should represent more than 60% of the total market by year 2007.

For more information, contact Tim Meehan directly at [tmeehan@eclectictechnologiesinc.com](mailto:tmeehan@eclectictechnologiesinc.com)



A bit of sad news...

## Gene Cowherd Passes Away

A bit of sad news to report — Gene Cowherd, founder of GC Aero and member of the flex circuit community for a long, long time, passed away after a short bout with cancer. He was 77 years old.

Gene entered the flex biz in the early 1970's working for Fortin laminates, trouble-shooting problems at the various flex circuit manufacturers. He caught the flex circuit "bug" and in 1978 bought the flex circuit division of T&B Ansley.

According to his son, Jim, his dad's passion was flying and aerospace. An avid pilot, the company name GC Aero was spun from the acronym GCA that stands for "ground control approach" in pilot language. Much of the company's business in the early years was building flex circuits for the aerospace industry, and he was most at home flying his plane around the Western United States working with aerospace companies such as Northrop, Thiokol and Aero Jet.

Gene retired from GC Aero in the mid 90's, leaving the company in Jim's capable hands to pursue other interests such as sprint car racing.

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

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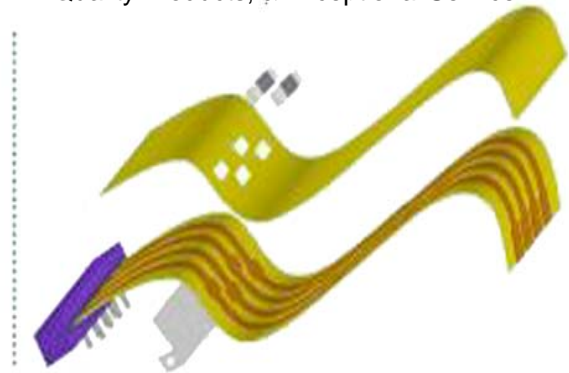


Gene Cowherd May 25, 1927 - February 18, 2005

Gene lived life with great enthusiasm and will be remembered for giving his love for life to the people around him. He died peacefully at his home, surrounded by his family.

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## Fine line flex circuits...

# Epigem Develops Process For High Density Flex Circuits

Epigem Ltd., a leader in the field of polymer-based microengineering, has developed a new process for single-layer flex circuits with traces as small as 3 microns and spaces as small as 5 microns.

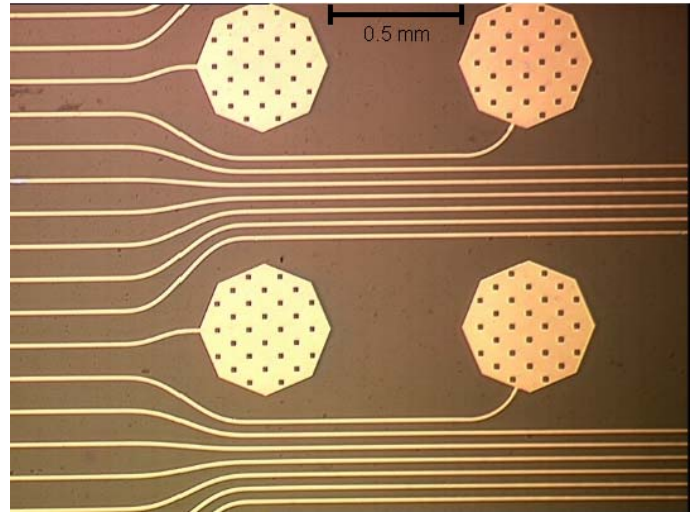
Perhaps more significant than the fine features is the thickness of the copper achievable using this process — traces can be as thick as they are wide! Epigem says they can make traces 50 microns thick. So if you need 10 micron traces with that are 10 microns thick — no problem!

This technology is only at “pilot plant” stage, and Epigem has so far developed the process for single layer flex circuits only. The company is looking for partners interested in licensing the technology and strategic partners to further develop the process for specific end-user needs, such as multilayer circuits, transparent circuitry, etc.

Epigem’s process is based on what they call UV embossing. They begin with a layer of sacrificial copper and cast a layer of polymer on it. This polymer will become the dielectric material between the traces.

The next step is to create an embossing tool. This tool, similar to a plate used to print a newspaper, will be used to press or “emboss” the trace pattern into the polymer, exposing the copper below.

After a desmearing operation to clean out any remaining polymer in the plating



Epigem flex circuits with 15 micron traces, 5 microns thick, on 30 micron pitch fanning out to 100 micron pitch. Bond pads have 20 micron square holes.

tracks, the traces are then plated up to the thickness of the polymer.

After the traces are plated up, the base dielectric material is laminated over the circuit. Because the base film is applied after the traces are plated it can be most any material — polyimide, polyester, PEN, paper, even rigid materials such as glass or

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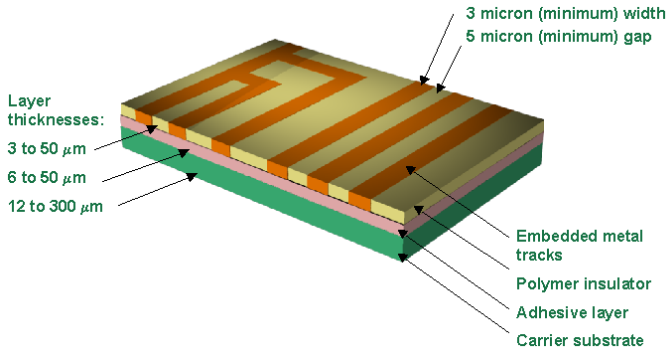
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Typical cross section of an “embossed” flex circuit.

silicon — whatever best fits the circuit’s end use.

The next step is what makes this process really unique. With the base material now laminated to the circuit, the circuit is peeled off the sacrificial copper sheet, leaving the traces and the dielectric polymer between them beautifully flush!

The circuit can then be used as it or have gold plating, coverfilm or solder mask applied to it.

Epigem has wisely chosen Cirflex Technology to help bring their technology to market. Contact Steve Payne and he’ll be happy to provide anyone with

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all the info they need! Here in the USA information can also be obtained from Tim Meehan at Eclectic Technologies in San Francisco.



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On a personal note...

## Marvelous Marvelous Mud

It has been an El Niño winter here in California and the warming of the Pacific ocean has brought lots of rain to the Left Coast. While folks in Southern California have gotten way too much, in Silicon Valley the amount has been just about right. Plenty of water to fill our reservoirs, lots of snow for the ski resorts, and best of all — lots of marvelous mud!



Saturday before son Mike had to go back to college the rain stopped. We knew there would be great goo at our favorite offroad park, Hollister Hills, but Hollister was closed for a dirt bike race. So Mike, his friend Paul and I set out for another park — Carnegie SVRA in nearby Livermore, hoping for good conditions.

Oh baby, were we pleasantly surprised!

We weren't sure what to expect, since the ranger at Carnegie said that the park

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was mostly for dirt bikes — four-wheel-drives were only allowed at the bottom of the hill. While she assured me that if we were looking for mud they had plenty, I wasn't prepared for what we found. It was just like a blind date that turned out unexpectedly wonderful.

ol' redneck fun in that marvelous marvelous mud. We returned to the suburbs with almost every square inch of the black paint covered with a thick, beautiful brown patina. We were so proud we parked the Jeep in front of the house and left her there for a few days — just to show off.

As the Jeep through the heavy brush surrounding the entrance, a big smile came across my face as the park stretched out before us. The bottom of the hill was a large flat area, about a quarter mile wide and about three miles long with a seasonal creek running about two feet deep. On both sides of the creek were long, wide, beautiful fields with mud ranging from six inches to a foot deep!

Mud runnin' in a four-wheel-drive is some of the most fun you can have with your clothes on, but the cleanup afterwards is really a drag. A few days passed and before I knew it Mike was on the plane back to college, so I got stuck with the job. It took days to take everything apart, hose it out and put it back together. I'm still finding some clay in various nooks and crannies, but I'd do it again tomorrow!

We spent the day giddily fording the creek, doing donuts, powerslides and just having lots of good

It's raining outside as I write this — maybe I'll call and check the conditions down in Hollister.



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