Size matters. A lot. In the world of high-tech, high-volume printed circuitry, miniaturisation is the coin of the realm. In short, increasingly small printed circuits translate to increasingly small finished electronics for consumers and industry. This, in turn, results in better, faster, more reliable and more functional products. Those producing functional devices in the printed electronics industry are on the cutting edge, striving daily for ways to give themselves a competitive advantage in this fast-paced, ever-evolving, increasingly competitive field.

Jonah Bilotta, General Manager at UTZ Technologies, Little Falls, New Jersey, USA, feels this pressure and the push toward small every day. “The common thread winding through all of printed electronics is a perpetual call for smaller and smaller lines, to allow for smaller circuitry and smaller products,” he explains. “The challenge is that not only do the lines have to be small, but they have to be incredibly high quality and consistent over longer and longer print runs.”

On the other side of the continent, in San Marcos, California, Elias Malfavon, echoes Bilotta’s challenge. His business, Metal Etch Services, Inc, manufactures finished screens for the printed electronics’ industry (as opposed to actually printing the circuitry).

“... not only do the lines have to be small, but they have to be incredibly high quality”

Malfavon is intimately aware of the demand for screens to accommodate small features. “Without a doubt, the single biggest question asked of us pertains to the ability to produce screens with lines and spaces down to 25µ. That’s small.”

**INTERDEPENDENT MARRIAGE**

The technical challenge manifests in a complex, interdependent marriage of mesh, emulsion, ink, and a host of speciality equipment, used in artful unison, often in a clean-room environment. There is very little tolerance for error. The recent trend toward larger format screens, coupled with the challenge of finer lines is an additional challenge, leaving many production managers scratching their heads.

“The small particle size and adhesion to the mesh will yield sharp details and exceptional print runs

Without a doubt, the single biggest question asked of us pertains to the ability to produce screens with lines and spaces down to 25µ. That’s small.”

The IKONICS Corporation, Duluth, Minnesota, through its Chromaline Screen Print Products division, recently launched its Alpha line of stencil-producing emulsions and capillary films. The Alpha line, specifically engineered to accommodate the challenges voiced by those working in the printed electronics’ industry, is allowing for printed lines as small as 20µ and, in the controlled environment of Chromaline Labs, applications specialist Mick Orr – a 40 year veteran in the industry – has managed to produce a 10µ line.
“The demand for finer and sharper stencils has never been more in demand,” Orr says. “I’ve been in printed electronics operations all over the world and have never seen anything quite like this. Printing a 20µ line in a production setting is an exceptionally challenging proposition – and, as challenging as it is for those working in the printed electronics field, it’s incredibly attractive to those who manufacture the electronics. And then, finally, to consumers of electronics, like you and me, we’re quite thrilled – expectant, actually – about having our devices get smaller and more functional and just plain cooler.”

Back at UTZ Technologies, Jonah Bilotta and Alpha specialist Marty Medvetz of the IKONICS Corporation discuss ways to optimise an upcoming print run, considering a host of variables. Bilotta pauses to make a point about the nature of the market itself.

**PRESSURE FOR SMALLER AND BETTER**

“As everyone is very well aware, this is a global industry. As such, Asian and European product developers have been working to come up with ways to accommodate the demand for smaller print sizes for years. To the extent they’ve been successful, we’ve seen a lot of the US market compromised. Regardless of where the actual work gets done, however, the pressure for smaller and better isn’t going away.”

For his part, Medvetz concurs, adding: “Notwithstanding the macro-economic realities of cheap labour markets and incumbent production manufacturing, the bottom line is that consumers are increasingly intolerant of expensive, clunky, obsolete electronics. So, no matter where a player is along the printed electronics supply chain, anyone that can add value to the process in the context of shrinking and improving the end product is increasingly critical.”

Back at Chromaline Labs, in Duluth, Minnesota, Mick Orr draws attention to a Scanning Electron Microscope (SEM) and several images projected on a bank of flat panel displays. “What you’re looking at is Alpha E-20 emulsion coated 1 x 4 on 400 stainless steel mesh, magnified 500 times.” Compared to similar images of screens coated with other emulsion products, the Alpha images are crisp, the edges smooth and the adherence to the mesh, consistent. “What you’re seeing,” Orr concludes, pointing to the edge where the emulsion meets the mesh, “is an opportunity for better electronics.”

**Further information:**
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Notice the straight shoulders and flat surface. This combination enables the printer to achieve fine line prints down to 20µ.