Brainstorm - MEMS

What do you perceive as the biggest hurdle for adoption on MEMS by engineers? (a) Lack of familiarity with MEMS-design tools; (b) Need for customization of MEMS devices;
(c) Lack of design tools for electronic application of MEMS; (d) Few simulation models for
MEMS devices; (e) Little understanding of MEMS capabilities and characteristics

Bob Scannell, Analog Devices

In the...industrial/instrumentation market, I would say the biggest hurdle is in device calibration, followed by overall integration and test. In many cases, this is not just a hurdle, but a barrier.

Calibration for MEMS devices...requires a unique combination of electrical and motion testing. Rotating test heads, shaker tables, and other required testers are typically not standard test equipment at many production sites.

Since applications within the industrial market tend to be pretty fragmented and thus lower volume, the costs associated with the design and test learning curve, and additional manufacturing equipment, are not as easy to justify via amortization.

Fortunately...some suppliers have the appropriate technology mix and industrial market insight to define MEMS products specifically optimized to industrial requirements. One key feature is fully

Karmjit Sidhu, AST

Lack of training and education for engineers have been the biggest hurdles for MEMS adoption at large scale industrial applications. For example, many companies are coming up with MEMS valves that are very different from conventional valves. The engineer expects the valves to be transparent in their operation. However, in reality, this is not the case. Traditional macro valves operate from low DC voltage or 125V/240V AC and are inductive in nature. The engineer can hear the 'click' when the valve opens or closes. MEMS valves are electrostatic in nature and require complex electronics to operate. Also, the MEMS valves are more delicate in nature to macro valves.

Another hurdle has been the lack of education and training of MEMS by local colleges and educational institutions...Unless the engineer, on a part-time basis, can attend college or

calibrated sensors. The benefit of this is that no motion test is required by the customer. These types of solutions can shave six to 12 months off of a design-to-production timeline, and...they greatly lower the risk involved in assessing a new technology's applicability to an existing application. click here for more! [1]

Donna Sandfox, Omron

My vote...is the “need for customization of MEMS devices.” With customization comes the potential loss of economies of scale and associated cost advantages. One way to overcome this obstacle is by designing an assortment of packaging and supporting electronic circuitry, such as signal processing options, to meet a wide variety of customers’ requirements while using the same MEMS sensing element. This approach allows manufacturers to maintain economies of scale on the production of the sensing element and still fulfill customization requirements from a broad customer base. To give an example...we use the same flow sensing element in six different product families and over 20 unique part numbers. “Value added”...is one way to think about how to customize products that incorporate MEMS elements. There may be other core competencies in your company that can be combined with your MEMS device to make a range of products that are attractive to a wider breadth of customers than the MEMS device alone. click here for more! [3]

Roger H. Grace, Roger Grace Associates

university that offer courses in MEMS and their applications and happens to be close to his work or home, he or she will not gain the benefits of MEMS. This is very visible as one can see clusters of MEMS companies and engineers in locations...supported by local universities that have strong MEMS programs at MS and PhD levels. click here for more! [2]

Julio Costa, RF Micro Devices

Three major factors have prevented RF MEMS switches from widespread use: 1) large actuation voltages (40V to 100V) are typically required for reliable switch actuation, 2) hermetic packaging is required for RF MEMS switches, and 3) long term reliability and lifetime requirements were not well understood for RF MEMS switches. With the advent of 3G and 4G cellular communication platforms, the need for a high performance/highly integrated switch module as well as an adaptive power amplifier module became very desirable. These are two complex applications that can really benefit from the higher performance of RF MEMS switches and can tolerate the needed overhead required by MEMS. For example, integrating a proprietary MEMS technology with its custom silicon IC platform provides all of the necessary actuation voltage supply, control and timing signals in a highly integrated die. RF Micro Devices...developed a proprietary WLP (wafer level package) process which allows for a low cost hermetic packaging flow consistent with the industry's need to provide flip-chip solutions. click here for more! [4]

 What follows are the opinions of the MEMS industry on one of the most significant topics addressed in the market research that I conduct yearly in creating “Barriers to the Commercialization of MEMS; An Updated Industry Report Card." Design for Manufacturing (DfM) has long plagued the MEMS industry. Typically, MEMS designers would create the MEMS device...and then design the package to accommodate the device. At this point, testability issues were an afterthought. For optimized low cost, robust MEMS devices to be possible, it necessitates “concurrent engineering” of device, package and test strategies with highly reliable, reproducible, robust and easy to manufacture at low cost components as the outcome. What needs to be done...is to create awareness in the industry as to the sub-optimal designs created as a result of the lack of a DfM philosophy and to encourage the adoption of concurrent engineering principals to the creation of MEMS designs. click here for more! [5]

Links:
[1] http://www.ecnmag.com/Brainstorm-MEMS-Analog-Devices.aspx
[2] http://www.ecnmag.com/Brainstorm-MEMS-AST.aspx
[3] http://www.ecnmag.com/Brainstorm-MEMS-Omron.aspx
[4] http://www.ecnmag.com/Brainstorm-MEMS-RF-Micro-Devices.aspx
[5] http://www.ecnmag.com/Brainstorm-MEMS-Roger.aspx