Sensors & Transducers Magazine (S&T e-Digest), Vol.66, Issue 4, April **2006,** *pp.521-525*

Sensors & Transducers

ISSN 1726-5479

http://www.sensorsportal.com

Status of the MEMS industry in 2006

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Received: 27 March 2006 Accepted: 21 April 2006 Published: 25 April 2006

Abstract

This article highlights the latest business vision of the MEMS industry by Yole Développement and answer questions what could happen in the MEMS industry and what are the key business trends. Different MEMS product families and market trends also reviewed.

Key words: MEMS industry, MEMS market

1. Introduction

As every year, YOLE Développement is analyzing the evolution of the MEMS industry in its new report "Status of the MEMS industry 06", available in April. The MEMS industry has seen in 2005 several important developments:

- Continuous growth of markets with applications which are booming (Si microphones, TPMS, 2D and 3D accelerometers …) with more than 100% growth compared to 2004 while other applications have stabilized (the DLP business from Texas Instruments has decreased by 8%, due to price reduction and inventory adjustment);
- Development of complete products by device manufacturers (compared to just the simple MEMS element) in order to embed MEMS into an added value module;
- Development of new consumer applications;
- Strong development in the contract manufacturing and foundry business with more than 35% growth on average;

- Strong M&A activities with creation of new important players (acquisition by Schneider Electric of BEI Technologies, including Systron Donner, acquisition by Honeywell of First Technology, a series of acquisitions by Measurement Specialties …);
- Changes in the policy of several key players (introduction of the new permanent ink-jet head by HP for example).

2. Many Heterogeneous Trends

The MEMS market has reached $ 5.1 Billion in 2005 (Figure 1 presents our latest forecast on the MEMS market, 2005-2010, based on Silicon). Another strong MEMS market is growing, based on polymers, mainly for drug delivery and in vitro diagnostic, but is not reported here. We expect that the MEMS markets will reach $ 9.7 Billion in 2010, representing a compound annual growth rate of almost 15 %. Table 1 presents the value of each of the major MEMS applications. Our forecast last year was a little higher (we estimated a 2005 market at $ 5.6 Billion): the main difference coming from a decrease of Texas Instrument sales (8 % decrease compared to a forecasted 20 % growth) and an adjustment of the value of the industrial pressure sensor market.

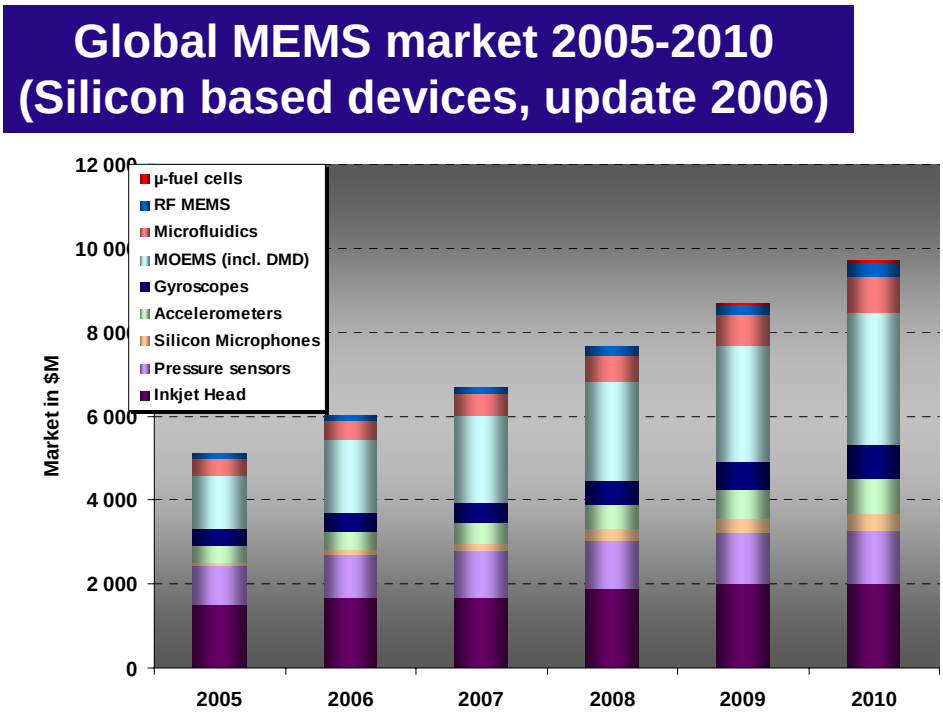

Fig.1. MEMS markets 2005-2010.

In reviewing the different MEMS product families, the trends are as follows:

- **Ink-jet head market**: the growth of the market value will, step-by-step, reach saturation around $ 1.8 to $ 2 Billion. On the other hand, the number of devices sold will decrease strongly due to the change of HP's strategy: with the introduction of their Scalable Printing Technology (SPT), the HP heads will no longer be disposable. The new head is big and designed for faster and more precise prints.
- **Pressure sensors**: the growth of the medical and automotive business is stable (around 12%). New applications like the Tire Pressure Monitoring System for cars are boosting this market (and Infineon/Sensonor is taking the major part of this growth).
- **Silicon Microphones**: the market has seen almost 100% growth in volume. Knowles Acoustics, with 100 Munits sold, is the only player producing in volume at the moment. SonionMEMS,

Memstech in 2005 and Akustica in 2006 now have devices available and 2006 will be a year of price pressure with another 100% growth in volume (according to our report on Silicon Microphones).

- **Accelerometers**: the acceleration sensor market has seen very different situation. The automotive business is increasing rapidly, with the growth of Electronic Stability Program (ESP), where the main players are VTI Technologies and Bosch). Consumer applications have really started to use MEMS sensors in volume for applications like mobile phones (human machine interface, activation of logos …), GPS, pedometers … The number of new systems using accelerometers is very important and we think the market could really be booming. The ability of the device manufacturers to make profit out of these applications is another story. Price pressure is very high
- **Gyroscopes**: strong growth of the overall market, due to different applications. The ESP market is growing very fast, with adoption of the system in medium end cars. Silicon and quartz devices are competing in this application. GPS is another growth area, both for automotive and autonomous systems (stand alone or within 2 years included as standard in mobile phones). We have also seen a strong development of silicon based military and security applications, with the introduction of new devices from Honeywell.
- **Optical MEMS**: this area is still dominated by Texas Instruments DLP. In 2005, the DLP market has decreased by 8% but we think this is mainly an accident. 2006 will see a restart of the growth. Other applications like IR image sensors (microbolometers) are also growing very fast, for security applications (the automotive business will not really start here before 2008). The optical telecommunications area is also restarting at very low level (less than $ 70 Million) but a few percent growths per year is expected. A lot of new products are close to commercialization, including barcode readers, heads-up displays, head-mounted displays …
- **Microfluidics**: the microfluidic field is mainly a non-silicon business (polymer is the key material for this application). A few systems are using silicon to activate fluids or for specific detection. This is a small business with 8% growth.
- **RF MEMS**: despite several announcements, only 2 products are already on the market in volume: the FBAR (Agilent and Infineon are the main producers) for telecommunication applications (replacement of ceramic duplexer) and the RF switch for automatic test equipment (new devices launched by Teravicta and Panasonic). We do not see a strong growth in RF applications for several reasons: MEMS-based RF switches are expensive and not adapted at the moment for mobile phones and the price decrease year after year is very high. Regarding FBAR, the increase in volume has just compensated the price decease for a flat market. New and very interesting devices have been announced in 2005 for availability in 2006, such as for the replacement of quartz oscillators using Silicon MEMS based devices
- **Micro fuel cell**: several companies including Hitachi, NEC, Fujitsu and STM have announced the launch of micro fuel cells in 2007 or 2008 (using methanol or hydrogen technology). We think that the start of this market will have a significant impact on MEMS business, starting in 2009 or 2010.

Table 1. Value of the world MEMS markets 2005-2010.

	2005	2006	2007	2008	2009	2010
Inkjet Head	1 532	1 663	1 660	1 881	2 004	2 015
Pressure sensors	911	1 053	1 150	1 172	1 206	1 254
Silicon Microphones	65	116	172	259	330	398
Accelerometers	394	431	472	571	699	860
Gyroscopes	398	435	506	595	691	801
MOEMS (incl. DMD)	1 292	1 743	2 069	2 348	2 748	3 154
Microfluidics	404	453	508	629	732	849
RF MEMS	105	128	150	199	259	331
µ-fuel cells	0	0	0	1	26	65
Total	**5 101**	**6 022**	**6 687**	**7 655**	**8 695**	**9 727**

3. A Constantly Moving Business

Consumer applications have really started to push the MEMS business in 2005. Many different devices are involved, like pressure sensors (altimeters), microphones, accelerometers, gyroscopes … One of the most significant consequences is that all the Top 50 semiconductor companies are now looking at these MEMS applications as possible growth areas. Another result of the growth of the MEMS market is the strong growth of the foundries and contract manufacturers. We have seen growth of more than 35 % in 2005 compared to 2004 and we expect (see Figure 2 extracted from the YOLE report "MEMS foundries") similar growth in the next 3 years. We believe that 2009 and 2010 will certainly not be so active and a re-start will then happen after 2010. One of the key trends of 2005 has been the strategic evolution of several players, changing their offerings from pure MEMS devices to MEMS based modules. We see this trend in several applications including silicon microphones (new products launch by Knowles Acoustics and SonionMEMS), inertial sensors (development of the Inertial Measurement Unit), chemical sensors (MICS has changed from device manufacturer to module manufacturer) and more than 10 other products. This is a very strong trend and will impact heavily the way MEMS manufacturers are working (and in the end will affect their margins). This change is analyzed in detail in the report "Status of the MEMS industry 2006".

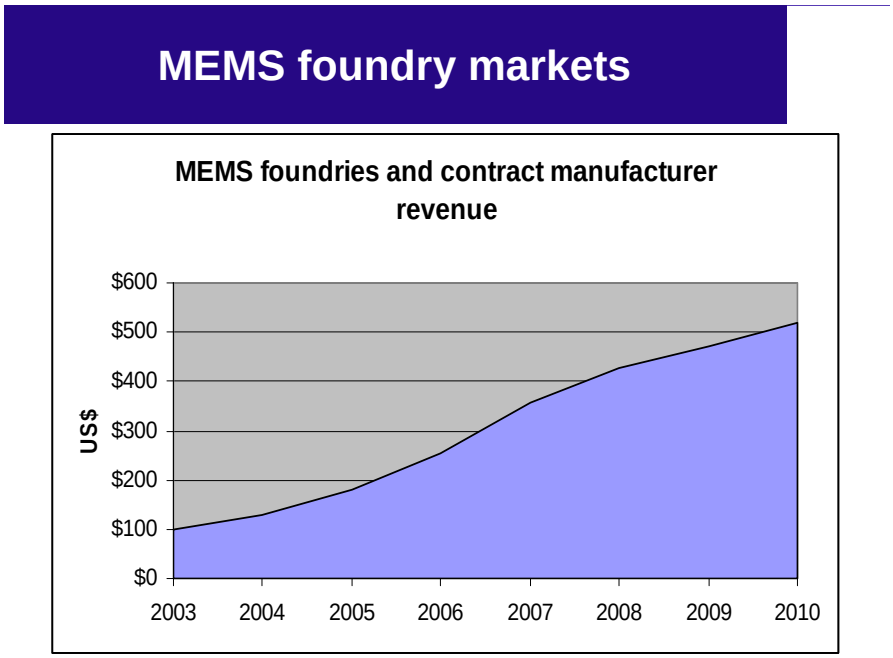

Fig.2. MEMS contract manufacturers and foundries market estimation.

4. Long Term Vision

What could happen in the MEMS industry? What are the key business trends? At YOLE Développement we think that the market will move in the following ways:

- **2005 market :**
  - 5.1 B$ worldwide
  - Very fragmented in terms of companies and products
- **2010 market :**
  - 9.7 B$ worldwide

  - MEMS foundries and contract manufacturers will account for at least 8 % of the world market with several being public companies
  - More than 50 % of today's systems companies who have integrated fabs will be using external manufacturers
  - Several large integrated companies will have created independent MEMS spinoffs
  - IC manufacturers will be deeply involved in MEMS manufacturing
- **2015 markets :**
  - 18 B$ worldwide
  - No more systems manufacturers with internal fabs
  - 50 % of the total market will be in the hands of semiconductor manufacturers

5. Conclusions

We are open to discussing these long-term trends but the key signs of the evolution of the MEMS markets are here. Overall, MEMS markets are still facing very important business opportunities … but not without key challenges. It is still a very exciting business and we are proud to be able to report in the right way on the evolution of the MEMS industry.
