Tooling and engineering: the European perspective

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In the previous edition of this Colloquium\(^1\) we have addressed some of the issues that the European tooling industry is facing in a changing global business environment. Let us review some of the key points we have covered:

- Tooling industry is changing and needs to review its business model and competitive positioning.
- Exports from China has been changing the competition landscape in the low and medium levels of the market, specially in industrial moulds (and moulds for injection of plastics within these) and has changed the international pricing levels in those segments.
- European tooling industry must concentrate in the high end of the tooling markets where it has a leading role in the international markets and to develop a business culture based on international networking and international trade.
- The portfolio of services and competences offered by the tooling companies is extending, both upside and downside, and the integration of the tooling competences with specialized molding is becoming more and more important for mouldmakers.
- Commercial investments are becoming as important as technology ones and soft skills for international networking are needed.
- Financial and capital requirements (specially for operating funds) are also increasing and becoming more demanding.
- European research programs are important to consolidate the engineering edge of European tooling industries and to foster an European knowledge base for engineering and tooling.

We anticipated that soon both OEMs and their first tier suppliers of plastic systems and components will purchase around 70% of their industrial moulds from low cost

\(^{1}\) see Menezes and Beira (2004)
countries (Eastern Asia / China in special) and that European and North American mouldmakers will compete for the remaining 30% of high precision and high complexity moulds on a basis of concurrent engineering, certified quality and advanced technologies competences, together with strong partnerships in design, manufacturing (and even assembling and logistics). The management of the supply chain with multinational OEMs calls for new commercial competences and relationship building.

We have also argued that specialized independent “custom moulders” in the international markets are becoming more and more important for the European tooling companies.

Finally strong tooling industry is critical for a sustainable industrial European policy and for its geostrategy ambitions in the world system. Tooling competences and imbedded skills for advanced product design and production are key factors to the defense and aerospace related industries. Recent USA evidence strongly supports that view: replacement parts for heavy defense equipment is becoming a difficult issue for military procurement due to the outsourcing of casting activities and related tooling to Asian companies.

Two years later we feel that these arguments continue valid.

We will review the data about the European tooling industry in the international scenario and we argue that the industry needs to add a strong and continuous effort for institutional recognition in Brussels and EU governing bodies, as well as by the national governments. Tooling industries are very much fragmented and small / medium size enterprises. An active European policy to support the tooling industry competitive edge is important and should be high in the agenda for European companies. An international forum can add visibility for that.

Two years later, what is happening with China? We review the last available evidence of international trade and we conclude that China drive for exporting moulds to the world is not softening. But the imports of tools and moulds by China are also growing healthy.

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2 For some discussion about the case of the automobile industry, see Menezes and Beira (2005)
and continue to be huge market. How can European companies increase their role in supplying this large and growing market?
1. EU25 tooling industry: a major player

We will have a look at the trends in the world system of tools, dies and moulds from an UE 25 and China perspective, based on available data (including 2005 trade data).

Trade on tools, dies and moulds is reported under several codes in Eurostat as well as in UN Comtrade databases of international trade. We aggregate them under three main groups:

- industrial moulds (including moulds for plastics, for metals and other materials),
- tools for pressing and punching,
- cutting and extrusion dies.

Figure 1 presents the extra EU25 imports and exports of all classes of tools, dies and moulds. It is clear that EU is a net exporter with a net balance of 700 billion euros in 2005. The net balance has doubled in the last ten years.

The structure of the imports and exports (figure 2) shows the importance of the industrial moulds exports in the trade. Net balance for press tools and for cutting and extrusion dies is small and in some years reversed. Export driven balance is due to the industrial moulds trade (figure 3).

Intra EU trade (measured by imports by EU countries from other EU countries) is very active and large (figure 4) and again dominated by the industrial moulds volume, although press tooling represents close to 30%. But internal trade in industrial moulds shows a negative trend in the last two years. Data suggests a substitution of some of the trade by imports from non EU countries (Asia).

The structure of internal trade and extra EU imports and exports in 2005 trade flows is presented in figure 5 at the lower level of data aggregation.
Data for the main actors (countries) in the world tool and mould markets in 2004 are presented in figure 6. Tooling statistics are a difficult issue due to the different views of the boundaries of the industry and the products included. Production data is the more difficult to estimate and different sources can lead to different values. We reviewed the different sources and our best estimation is in these tables. The value for the internal market or apparent consumption is estimated from the production, import and export data.

EU as a group is a major actor, side by side with USA and Japan, and clearly ahead (in volume) of China. EU has a very large internal market, and it is the second largest exporter (after Japan), although close to 80% of the production is for the intra EU market. Please note that EU exports considered are only for non EU countries, so the relation with German exports is complex: German exports are both for EU and non EU countries.

Figure 7 repeats the exercise for industrial moulds only (at the same scale for the ordinate). EU again has a powerful position as the leading exporter and with an internal market very close to the leader.

EU global trade deficit with China is a different one from the USA, but it is a cause of concern for the EU authorities. Higher exports to China can help to reduce the problem. EU policies towards supplies of advanced tooling to China should be high in the European agenda for tooling.

2. What is happening with China trade?

During 2005, growth rate of the exports of tools, dies and moulds reported by China to the world has grown 50%. During last 5 years, growth rate per year has been around 30%. This is an impressive performance.

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3 a preliminary version has been presented in Beira (2005). Data and estimates have been deeply revised now
4 For a more detailed discussion, see Beira (2006b)
But China imports are systematically higher than the exports and have shown a two digit growth in each of the last two years. Figure 8 shows the consolidated values for import and export of tools, dies and moulds by China\(^5\). Relative changes per year are plotted in figure 9. Trades in industrial moulds clearly dominate both the imports and the exports, but exports are basically industrial moulds. Imports of press tools become more significant in the last years (see also figure 10).

The bilateral flows of China with the most important partners (Hong Kong, Germany, Japan, Taiwan and USA) are shown in Figure 11. The performance of Japan and Taiwan as suppliers of China is impressive – but German is becoming a solid number three in a large market with a growing demand. Italy performance (not shown in the figure) is also interesting.

One of the most significant changes in 2005 data is the number of export destinations of Chinese moulds: from 27 in 2002 to 41 two years later and 94 in 2005. The number of origins of imports has also increased, but much less (from 27 in 2002 to 59 in 2005). The openness of China trade in moulds is shown by these data, but it also shows that the club of suppliers is much more limited that of buyers and that China is virtually exporting to all active countries in the tooling business. This is a remarkable fact, although the new destinations have represented less than 15% of the exports in 2005.

The trends of import and export of industrial moulds by geographic region are visible in figures 13 and 14 (as well as their structure). Regional trade with asian countries dominate the China trade flows in tooling. The role of Europe and USA can be easily identified.

Really entrepot trade through Hong Kong, both for imports and for exports, distort the picture. A more detailed analysis shows that the principal destination of Chinese exports is really the USA: around 100 million USD in 2005 (as reported by China). Japan, Taiwan, Thailand, Germany, Singapore, France, Malaysia, Korea and Indonesia are the remaining top 10 final destinations of Chinese exports, direct plus through Hong Kong \(^6\).

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\(^5\) As reported by China in the UN Comtrade database
\(^6\) A detailed analysis of reexports of industrial moulds by Hong Kong and by USA is included in Beira (2003b)
International trade in industrial moulds is concentrated in a few number of countries. Around 25 countries represent close to 90% both of imports and exports\(^7\). The system can be visualized in figure 15\(^8\). The countries in the core region dominate the international trade. China is now clearly positioned in the central subcore from Asia, close to Japan, USA and Germany / Italy (from the European subcore). India is still clearly in the periphery, far from the core\(^9\). No analysis of the tooling markets is now credible without China, both as a big buyer and as a growing low cost supplier.

China openness and reforms\(^10\) have a deep impact at the regional level and consequences on the business model of the European tooling companies.

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\(^7\) An analysis of the trends of industrial moulds trade in the last 10 years is presented in Beira (2006c)

\(^8\) Network of bidirectional trade visualized through the energizing 2D Fruchterman Reingold algorithm. Distance between nodes (countries) express the strength of their ties as closely as possible, allowing the identification of a central core of countries that dominate the international trade. Drawing from Pajek software for network analysis (http://vlado.fmf.uni-lj.si/pub/networks/pajek), based on a squared matrix from UN Comtrade data relative to 2004 (full data for 2005 is still not available). Only flows with value higher than of 1 million USD were considered. For details of the technique, see Nooy et al (2005)

\(^9\) For a more detailed discussion of the India tooling market, see Beira (2006a)

\(^10\) For a full discussion of the reforms, see OECD (2005) first economic survey on China and a very recent NBER Working paper (Branstetter and Lardy, 2006)
References:


Figure 1: Extra EU25 imports of tools, dies and moulds, 1995 to 2005.
Units: million euros. Source: Eurostat database for international trade.
Figure 2: EU25 exports and imports of tools, dies and moulds to non EU25 countries, by type of product (1995 to 2005).
Units: million euros. Source: Eurostat database for international trade.
Figure 3: Net trade (exports minus imports) of EU25 with non EU25 countries, by type of product, 1995 to 2005.

Unit: million euros. Source: Eurostat database for international trade.
Figure 4: Internal EU25 trade of tools, dies and moulds (as reported by EU25 importing countries), 1995 to 2005

Units: million euros. Source: Eurostat database for international trade
Figure 5: Volume and structure of intra and extra EU25 trade of tools, dies and moulds, by elementary type of product, 1995 to 2005

Units: million euros. Source: Eurostat database for international trade
Figure 6: Principal actors (countries) for 2004 of the global tool, dies and mould markets (exports, imports and production for internal market).
Units: million USD. Sources: several (see Beira, 2006b)
Figure 7: Principal actors (countries) for 2004 of the global industrial moulds markets (exports, imports and production for internal market).

Units: million USD. Sources: several (see Beira, 2006b)
Figure 8: Imports and exports of tools, dies and moulds by China, as reported by China, by types of products, 1992 to 2005

820720: cutting and extrusion dies
820730: press and punch tools
8480: industrial moulds

Units: million USD. Source: UN Comtrade database
Figure 9: Change rate (%) per year of imports and exports of tools, dies and moulds by China, as reported by China, 1992 to 2005

Based on UN Comtrade database data.
Figure 10: Share of industrial moulds in the imports and exports of tools, dies and moulds by China, as reported by China, 1992 to 2005

Based on UN Comtrade database data.
Figure 11: Exports (left) and imports (right) of tools, dies and moulds by China, by principal trade partners (countries), as reported by China, 1992 to 2005

Units: million USD. Source: UN Comtrade database
Figure 12: Number of trade partners for imports and exports of tools, dies and moulds, by China, as reported by China, 1992 to 2005

Based on UN Comtrade database data.
Figure 13: Exports of industrial moulds by China, by geographic zone (top) and its structure (% bottom), as reported by China, 1992 to 2005
Units: million USD and percentages. Based on UN Comtrade database data.
Figure 14: Imports of industrial moulds by China, by geographic zone (top) and its structure (% bottom), as reported by China, 1992 to 2005
Units: million USD and percentages. Based on UN Comtrade database data.
Figure 15: World system of international trade of industrial moulds between 98 different countries (2004).

Based on UN Comtrade database data. Colors identifies the continent of the country.