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Machinery Industry

Market Structure, Performance, Key Players

Machinery Manufacturing Industry is the sector that determines the limits and future of the development in other industries, as it is the basic industry branch that provides the equipment needed for the development of these industries. Machinery Sector, which is an integral part of the industry, has an important place in many sectors from health to food. The Machinery Sector, especially in recent years, has strengthened its determinant role in the production of competitiveness and added value in the sectors it provides input, with the effect of technological developments such as automation, artificial intelligence and machine learning.

In recent years, it is seen that machine orders are replaced by integrated plant and system orders, especially in developed countries. This situation increases the demand for machines integrated into the production process rather than machines at a certain point in production. It is anticipated that more efficient machines with digital base and working with full automation will be preferred more in the coming periods, therefore, R&D and innovation will be decisive in the competition between machine manufacturers.



Although the machinery sector, which needs high capital, trained personnel and R&D, has concentrated in developed countries, it has started to move to these countries with the effect of increasing investments and technological know-how in developing countries. While countries such as China, India and Mexico become important bases in machine production, China, Germany, USA and Japan meet half of the total world machinery needs. However, Turkey's share in the global machinery production, despite the developments in the sector in the last decade, maintains the level of previous years.

When the shares of the sub-sectors of the Machinery Manufacturing Industry in the total machinery sector production value are examined, it is seen that the highest shares are taken by the production of cooling and ventilation equipment, engine and turbine manufacturing, lifting and handling equipment and agro-forestry machinery manufacturing.

China is one of the biggest suppliers of our country for machinery imports. China, which is rapidly developing competitive products in terms of technology and quality, is challenging our manufacturers in Eskişehir region with its difficult-to-reach price level.

Due to the ever-changing competition conditions that are getting harder with each day and the foreign dependency of our country in terms of raw materials, the sector representatives in the Eskişehir region have started to see exports as a safe harbor.

The tendency to open up to foreign markets, caused by the variable input costs indexed to foreign currency, is gradually increasing, as a natural result of this, companies need to move their production and product qualities to competitive levels in the global market.

The corporate experience of companies that have been diagnosed in the Machinery Manufacturing sector in Eskişehir is between 20-25 years on average. Firms tend to produce high value-added and special products instead of achieving the highest possible sales by producing cheaper. Due to these preferences, many companies have become strong companies that are leaders or leaders in their own manufacturing branches.









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In the Eskişehir region, most of the companies in the Machinery Manufacturing sector are trying to produce high value-added, innovative and boutique (in line with customer special demands) instead of conventional products with high quantities. Efforts to change the existing technical infrastructures, where R&D and P&D activities are shaped within this framework, are dominant.

In order to achieve favorable conditions in areas requiring investment such as innovation and R&D, the required investments are usually covered by equity. For this reason, the companies experience no financial problems or limited access to finance.

Due to the Covid-19 pandemic, which started in the first quarter of 2020, there are problems in the supply of raw materials for the machinery manufacturing sector, as in many areas in our country. From time to time, problems occur due to the supply of steel at certain quality levels, insufficiency of domestic productions and difficulties in procuring from abroad.

In the first periods of the pandemic, there was a decrease in the sales of the sector, as in all manufacturing areas. From time to time, problems occur due to the supply of steel at certain quality levels, insufficiency of domestic productions and difficulties in procuring from abroad.

Although Turkey is one of the important countries engaged in machinery manufacturing, companies are negatively affected by the fact that almost all of the raw material and input costs of the sector are provided in exchange for foreign currency and the fluctuations in the exchange rate.



The need for competent, qualified and expert workforce, which is felt in all fields of work in our country, constitutes one of the main problems in the Eskişehir region. There are intense problems especially in accessing blue-collar specialist personnel.

When the data before the pandemic are evaluated, it is seen that the biggest deficit in the workforce is in the Machinery Manufacturing sector with 30%. Most of the companies in the region prefer to make up for this deficit in the workforce with their own resources and internal training.

Technical support and technological development tools required by SMEs

Given the fact that Turkey machinery industry consists of SMEs, this situation has advantages and disadvantages. The main advantages of SMEs are their operational flexibility and limited regional concentration. Access to finance, limited R&D budgets and qualified personnel employment can be considered as the disadvantages of the current situation in the sector.

In the Machinery Manufacturing sector, where the industrial design studies are not much need, functionality and reliability are generally at the forefront rather than style and ergonomics. Despite this, many companies in the sector do not carry out any work on DFMEA and Robust Design.

Engineering teams within the companies mainly carry out P&D activities, and when they find the opportunity, they also carry out studies on R&D and Innovation. As a result of this, some companies think that sufficient resources and time cannot be allocated to Patent and Utility Model Registration issues, and that the know-how and experience they have are sufficient for them.

Firms in the Machine Manufacturing sector generally prefer Solidworks as 3D and 2D modeling software. The program, which has a useful and simple interface, meets the basic needs of the sector with its analysis modules. However, almost none of the companies have a team and software on analysis. There is a need for expert and reliable outsourcing, especially for Thermal, Dynamic and Flow analysis.









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Less than 30% of companies with a diagnosis study in the sector have 3D printers. Again, up to one third of the companies in the same group state that they need support for rapid prototyping and they can prefer outsourcing if it is economical. It is preferred especially for prototype works to be done 3-5 times a year, by the companies that do not want to make any additional investments. It is predicted that the general trend is on the use of Metal 3D printers, and there may be more demand in this regard than other services. Reverse engineering studies are rarely done.

Most of the SMEs in the machinery manufacturing sector in Eskişehir region do not have sufficient personnel and infrastructure in Test and Validation issues. The lack of institutions that provide worldclass testing and validation services in almost every field of Turkish Industry is among the most expressed problems in meetings by sector representatives. Required services are provided with foreign resources.

Placing industrial SMEs in Eskişehir's innovation eco-system

In the light of the feedback received during the interviews with the companies participating in the Diagnosis Study, it was understood that the interaction and cooperation between Commercial Organizations, Professional Chambers, Public Institutions, Universities, Clusters and Research regions in Eskişehir did not create as much positive effect as expected, contrary to the information obtained in the desk research. All of the company representatives state that the work done so far is far from expectations, therefore the collective work culture has not been formed in Eskişehir.

Turkey Machinery Industry, especially in Eskişehir, producing high-quality parts and components at competitive prices. As mentioned in the different reports within the scope of the study, the strongest aspect of the Machinery Manufacturing sector in our country is its ability to provide fast engineering solutions. It is understood that the conditions of incentives given by the state in R&D, Innovation and Prototype investments and infrastructure development do not meet the expectations of SMEs in the region, the conditions are heavy for many SMEs, and they are not preferred because of long processes and cumbersome procedures that extend their project durations. Similarly, for the reasons stated, almost half of the companies participating in the Diagnostic Study state that they want to stay away from studies with UILs and Universities.

Although some companies strive to guarantee their inventions in the sector with Patent and Utility Model Registration, some companies allocate serious time and resources to this issue both in the past and today, there are also companies that state that working on Patent and Registration issues is a waste of time. As a general justification, it has been shown that there is no result from the applications made in the past and / or the product and model lifetimes are less than the time taken for the patent / utility model application.

Difficulties experienced by SMEs in R&D and Innovation

During the diagnostic study conducted with eleven companies operating in the machinery manufacturing industry in the Eskişehir region, many different problems arising from the differences in the business lines of the companies, financial structures and volumes were identified. However, it is necessary to group the problems under six common headings in order to cover the majority of the support to be given to the sector. These main problems are;

Few firms provide competent consultancy services on Engineering, R&D and Prototype incentives that will serve SMEs in the region. For this reason, the incentive applications made were inconclusive and the costs of the work carried out were covered by the companies. The cumbersome bureaucratic structure in the incentive system excludes SMEs working with











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short project periods from participating in the incentive system and the required financing is mostly realized with enough of the equity capital.

- SMEs in the sector try to manage all design and manufacturing activities with the existing engineering teams, most of them do not have a defined engineering, development and test/ validation process. The disciplinary work and methodology, which is the basis of R&D and Innovation issues, is lacking in many SMEs. As a result of this deficiency, the current innovation potential cannot be revealed sufficiently.
- The majority of SME officials confuse the definitions of R&D and P&D, and companies cannot allocate sufficient time and resources for R&D studies. Companies that focus on production and creating new products are moving away from Innovation and R&D way of thinking.
- It is expected that the workforce that can be employed on Innovation and R&D issues will be people who are familiar with Global and Sectoral developments, who follow new technologies or have an idea and can generate new ideas. In the current situation, although there are two State Universities and a Technical University throughout the province, companies have difficulty in finding qualified personnel and competent engineers at all levels and branches.
- Most of the cost inputs of the Machinery Manufacturing sector are foreign currency dependent. Recently, the anxiety environment created as a result of the fluctuations in the exchange rates limits new investment initiatives in R&D and Innovation.
- Price pressure created by equivalent products imported from China, has effect on profitability or low profit expectation limit the investment in R&D and Innovation.



Summary of Insights and Conclusions

Eskişehir province hosts many SMEs in the sector due to its relative proximity to important industrial cities and logistics centres such as Ankara, Istanbul, Bursa and Kocaeli. The Machinery Manufacturing Industry is in a key position in terms of both meeting domestic machinery and equipment needs and providing foreign currency inflow to our country through export. Companies operating in the fields of Food Machinery, Information Technology Equipment, Manufacturing Benches (CNC) and Machine Equipment manufacturing were selected from among the important Machinery Manufacturing Industry representatives of Eskişehir Region.

In the interviews with the representatives of the eleven companies mentioned above, it was observed that the focus was on production in some sub-branches of the sector (especially in the field of food machinery production), and the companies postponed or ignored the structural and managerial changes necessary for progress in the fields of R&D, Innovation and Engineering. Production-oriented work, as in most areas, overshadows the need for change and creates resistance to innovative approaches across the sector.

It would be appropriate to make the following generalizations regarding the types of services needed for the machinery manufacturing sector:

Due to the fact that the majority of the products in the sector are produced in line with customer demands and the number of standard products is low, the need for prototypes is almost negligible. Prototype requirements can be met by companies' own internal resources. 30% of the companies participating in the study think of getting support for the production of models and prototypes with 3D Metal Printer.

There is a minor need for wire erosion machining.

In the sector where reverse engineering studies are rarely used, 3D surface scanning device is often used in quality control studies for final product verification.









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- Many companies in the sector can do analyzes at the basic level. However, programs that can achieve more reliable results and expert personnel are needed. Generally while the needs are voiced for;
 - o Thermal Analysis
 - o Dynamic Analysis
 - o Fluid Analysis

special solutions for companies in the sector can also be evaluated. (Ex: Test Equipment or Software development)

It is understood that the engineering teams of the company need training in subjects that will change their R&D, Innovation and Engineering perspective, improve their processes, and visibly increase the competence of engineering teams. (Technology Development, DFMEA, Robust Design, Design for Excellence etc.)

In addition to the above evaluations, it should be stated that the companies in the Machinery Manufacturing sector are reluctant to give their new product development and prototype works to an external company on a turnkey basis due to the short project durations (3-9 months on average). Most of the companies participating in the Diagnostic Study state that they have tried to work in this way in the past, but they will not try this again due to the difficulties they experienced. It should be kept in mind that it is not preferred to give turnkey projects to outsourcing companies unless there is a company that is more competent than them in their field of activity, but it should be taken into account that there is a need for a certain number of services or prototype parts / systems in the projects.



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