STEP 1.6 CASE STUDY

Detailed analysis in a mechanical company

The company, based in Tunisia, is a large producer of shock absorbers for automobiles and heavy trucks, exporting its products to Europe, Africa and Middle East.

Resource efficiency is pivotal for the company's strategy currently focused on competitiveness and continuous improvement. The TEST project provided the company with the required tools for reducing the overall costs of production, by reducing the consumption of inputs – such as raw materials, chemicals, spare parts and energy - but also the cost of environmental compliance.

The project was implemented over a two-year period (2015 – 2016) and the story assesses the analysis process and the progress achieved through the implementation of the MFCA approach and adoption of Resource Efficiency measures. The project team was led by the company's quality manager. It included some internal staff from production and accounting, and was supported by an external MFCA consultant.

Step 1.4: Identification of priority flows

Before the implementation of the MFCA tool, the company had no precise idea about the NPO costs. The only available figures were about some NPO quantities and costs at the company boundary for wastewater and solid waste management. There was no data on the NPO value of inputs and especially no data on how NPO costs were distributed along the production process in term of quantities and value.
At this stage, the MFCA tool allowed the TEST Team to:

- map all inputs and outputs at the company boundary level
- have a quantitative and financial estimate of all the NPOs

The first MFCA-based analysis revealed some unexpected results which surprised the company's top management as they did not expected company losses to be so high:

- Total NPOs costs represent approximately 13% of total production costs in 2015
- Environmental costs: 36,600 €/year – this turned out to be 4% of total NPO costs;
- Losses of raw materials: 150,000 €/year – this amounted to 16.3% of the total NPO costs and 2.7% of the overall production costs;
- Operating materials: 550,000 €/year – this was 59.3% of the NPO costs or 9.81% of the overall production costs;
- Energy consumption: 180,000 €/year – this represented 19% of the total NPO costs or 3.15% of the total production costs

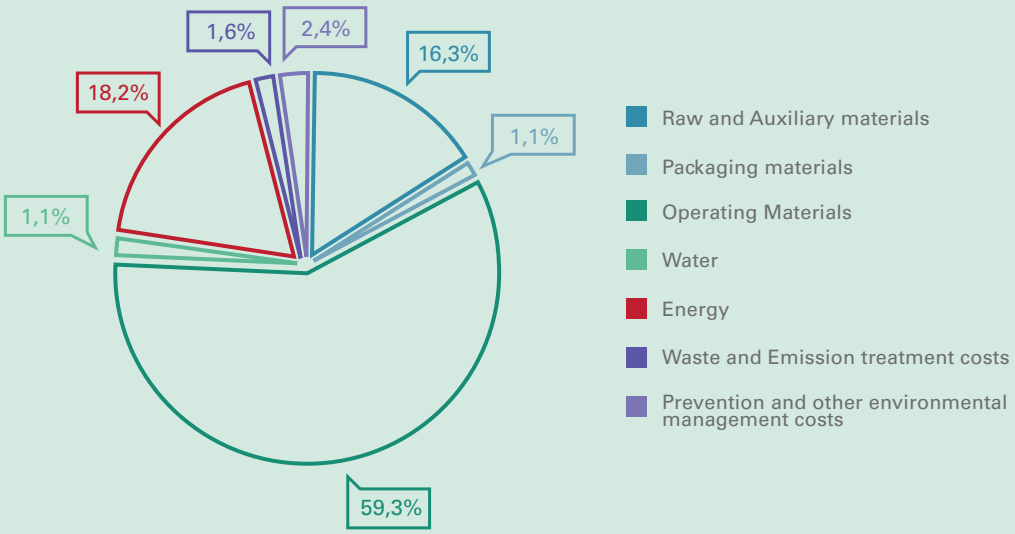

Figure 1 Breakdown of NPO costs in a company of the automotive sector

The MFCA indicated three main areas of intervention to the TEST Team, taking into consideration both the environmental impact and the potential for further improvements:

1. Raw & Auxiliary materials (in particular, steel tubes and rods)
2. Operating Materials (in particular lubricants)
3. Energy

These choices were approved by the top management.

Improving information system on resource efficiency

The TEST team was asked to work on the company's accountancy and other databases to obtain estimates of specific values. Guided by the TEST Team, the company took the following actions:

- It put in place a weighing system at different stages of the production process to calculate the losses of those raw and operational materials which had been identified as priority flows;
- It classified raw materials, articles and components by family and created one specific code in the information systems for each significant raw material;
- It weighed the different components to determine the average mass by family
- It set up different meters to measure energy consumption by production process and by energy-consuming equipment;
- It decided to implement an energy management system based on ISO 50001

The TEST Team has also searched the data sources to be recorded in the MFCA tool to enable future follow up initiatives. Although more work on the information system is required to get more detailed and relevant data, the company has made substantial progress in upgrading its information system.

Step 1.5: Identification of focus areas

The second phase of the MFCA analysis during step 1.5 consisted in determining the allocation of the NPOs along the production process to identify the areas requiring a more detailed analysis. This distribution the NPO costs (in Tunisian Dinars, TND) per process is presented in table 1. Note that the company could sometimes only estimate the NPOs since the existing information system was not capable of providing such data.

		PROCESS / WORKSHOP					
PRIORITY FLOW	TOTAL, EURO	WELDING	MACHINING	MOUNTING	CHROMING & PAINTING	PACKAGING	OTHERS
Raw & Auxiliary materials	141,421	49,615	43,725	25,380	18,148		4,551
Packaging materials	8,950					8,950	0
Operating materials	385,229	111,379	107,442	94,778	51,625	14,574	5,427
Water	¤ 6,512						¤ 6,512
Energy	201,435	19,443	121,837	11,471	28,539		20,143
TOTALS	**€ 743,572**	**€ 180,439**	**€ 273,006**	**€ 131,630**	**€ 98,313**	**€ 23,524**	**€ 36,634**

Table 1 Breakdown of NPO costs in a company of the automotive sector

Based on this analysis, the company selected the following focus areas related to the processes of:

- Machining
- Chroming and Painting
- Welding

Chroming and plating were selected over mounting because of high identified potential for improvement compared to the mounting process, as per expert judgement.
The result of the MFCA analysis convinced the top management to give its full support to the TEST project going on to identify sources and causes of losses and to develop and implement RECP measures.

Step 1.6: Identification of sources and causes of losses

The TEST Team, with the support of an external metal sector and resource efficiency expert, consequently undertook a detailed analysis to identify the major sources and causes of material and energy losses in all the focus areas.

The analysis focused on assessing the technology used and on observing the operating and good housekeeping practices. The TEST team held brainstorming sessions dedicated to analysing the causes related to losses in the key flows in each focus area. Each potential cause they identified was traced back to its root cause. The Team used the fishbone diagram method to assist them in this analysis. Figure 2 shows the result for the Team's analysis of the chromium plating process.

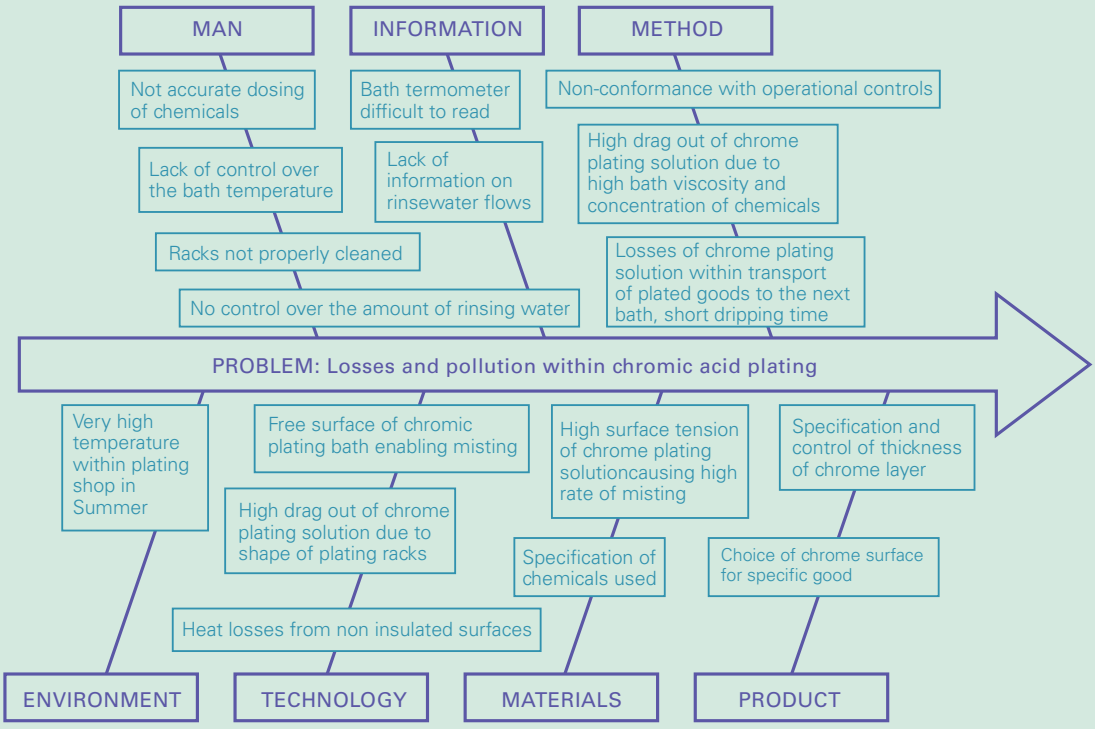

Figure 2 Fishbone diagram for chrome plating process

The project team prioritized the following causes of inefficiencies and waste generation:

- Non-conformance with operational controls in the chroming process, leading to wasted chromium (30kg/per week) and irregular surface treatment which was causing partial oxidation of the coated metal rods.
- The machining process and cleaning procedures resulting in fluids contaminated with lubricants that are a hazardous waste with no possibility for reuse and recycling.
- Non-compliance with operating welding parameters and standards, generating steel scrap from the welding process.
- Poor conditions and maintenance of certain welding stations, generating steel scrap.
- Excessive overspray in the paint workshop, resulting in high losses of paint (30-40% of input) with high emissions of solvents and generation of hazardous sludge.
- Storing wastewater on-site instead of sending it to the industrial water treatment plant, causing high costs of wastewater management

In parallel, an external local expert conducted an energy diagnosis to identify areas of excessive consumption and possible improvement options. Inefficiencies were found in equipment, the lighting system, the compressed air and steam networks, and utility equipment (compressors and boilers). These were considered as the areas where the highest savings could be reached.

The implementation of this step highlighted the importance of teamwork and especially the involvement of the company workers on the shop floor who provided significant inputs for analysing the causes of inefficiency.

The experience of the external experts was also a good asset for building confidence in the analysis process as well as providing information on the knowledge on the latest developments and best available techniques.

Conclusions

The company implemented a series of actions to reduce raw material and energy consumption such as:

- Installing a centrifugal separation system, to reduce the consumption of cutting oil in the machining process by 75%, and to also make it recyclable;
- Switching from liquid to a more efficient powder painting process, to reduce losses from 30% to 8%, and to not generate a sludge requiring treatment;
- Implementing energy efficiency measures, to reduce by 12% the energy consumption (preventive maintenance of the compressed air system, thermal insulation of the refrigeration system, and putting in place an energy management system).
- Designing training programs on RECP for employees, to increase competencies but to also increase their awareness of the importance of resource efficiency in production.

In summary, the implementation of the MFCA tool allowed the company to become properly aware of its NPOs, which in turn allowed it to implement the most promising actions to achieve resource efficiency targets based on best practices in the industry.

The MFCA tool proved to be efficient in monitoring and analysing the real costs of NPOs and in cost allocation, thus providing a sound basis for motivating the company to assess the root causes of losses and the feasible improvements through the application of resource efficiency measures based on best available techniques.

The company is already reaping the benefits of RECP with positive impact on its bottom line. This has motivated the company to further improve its information system by establishing analytical accounting system and to systematize the monitoring of raw materials consumption in quantity and in price on the ERP system.