

GREEN KPI'S AS DRIVERS FOR ENVIRONMENTAL IMPROVEMENTS ON SHOP FLOOR LEVEL

– A CASE STUDY AT ABB

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ABSTRACT

This paper is based on a case study, where local key performance indicators (KPI's) were developed for two production cells at one of ABB's Business Units. The two studied cells represented two important ABB Group environmental targets, since one cell was more energy intensive, while the other generated more unwanted process waste. The study indicated that employees at production cell level became more motivated in performing environmental improvement work after being engaged in developing local KPI's that suited their specific production situation. Using environmental KPI's designed to fit each production cell could also be used as driver for more focused environmental improvements by supporting the local operational management in prioritizing environmental improvement projects.

INTRODUCTION

Environmental management in manufacturing companies has undergone a strong development; from pollution control and emission prevention, to becoming more clearly linked to the company's business strategy due to stakeholders' tougher requirements on environmental performance. Consequently, an increasing number of companies are realizing that resource and energy efficiency and pro-active environmental management can give a competitive advantage rather than merely being a question of fulfilling environmental laws and regulations.

Central key performance indicators (KPI's) are being used on corporate level as a tool to drive, control and monitor environmental improvements for the entire company. However, it can be questioned if this approach is the most efficient way in achieving resource and energy efficient manufacturing sites. We believe that all employees at production shop floor level needs to be engaged in the continuous environmental improvement process and that local KPI's tailored for each specific cell could be a tool in achieving this. The local KPI's need to be aligned with the Group KPI's and implemented in the local environmental management system. Development of local KPI's demands operational tools and processes to map the environmental aspects and improvement potentials of each step in production. One such green

mapping tool is environmental value stream mapping developed by the US-Environmental Protection Agency (EPA, 2007).

This case study that was carried out at one of ABB's Business Units together with Mälardalens University, who provided knowledge regarding application of environmental improvement tools, like Green Performance Map (GPM) (Romvall *et al.* 2011; Bellgran *et al.* 2012) and Green Lean (Kurdve *et al.* 2011). The GPM tool was used in this study and it facilitated the identification and prioritization of environmental aspects in the two studied production cells. The aim of the study was to investigate how to facilitate environmental improvement work at the two production cells, increase the level of engagement of the shop floor workers, and to see if/how the use of KPI's could be utilized in the process. The conclusion of the study was that an understanding of the specific environmental issues within each production cell could be enhanced and that the Green Performance Map (GPM) proved to be a valuable tool in the process.

METHODOLOGY

This paper is based on a case study including literature review on environmental KPI's, interviews, observations and a workshop on GPM. The main areas covered in this study were how to increase the engagement of shop floor workers with regards to sustainability and responsibility for environmental performance on site.

Local KPI's

- Mapping of ABB's environmental targets and KPI's on multiple levels (global, country and local business unit).
- Mapping of resources used at the two studied cells, like energy, scrap rate, value added and non-value added materials.
- Development of measurable environmental indicators for each of the two studied cells.

Green Performance Mapping

- Workshop on Green Performance Mapping using one of the investigated cells.

RESULTS

The use of the GPM tool proved to be a good starting point for assessing the environmental issues in each cell. The use of the GPM tool was preceded by a training session where the structured method was presented. The exercise was carried out in a group consisting of shop floor workers, process engineers, production manager and environmental specialists. The tool helped the group to analyze the cell in a new structured way. Figure 1 shows the final results, where the most negative non-value added environmental aspects were marked with red. The discussion held during the process was of high value for the Business Unit. It indicated creativity with regards to problem solving, identification of new critical issues and a will to change and improve. ABB Sweden has a process for organizational developments that involves all staff, where the use of the GPM tool easily could be introduced for manufacturing sites.

The results from the GPM process proved to be valuable when planning future environmental improvement projects. The tool made it easy to identify non-value added materials. Based on the outcome of the GPM for each cell together with observations and interviews local KPI's could be developed, as illustrated in Table 1. The new KPI's triggered discussions with suppliers, process engineers and real estate. For example, cell 1 used a high level of value-added material, which unfortunately due to the high margin of material delivered in the packaging resulted in a large amount of unnecessary waste. Together with the supplier this could be reduced. It was decided to use two KPI's for cell 2 in order to address both oil spills and energy used.

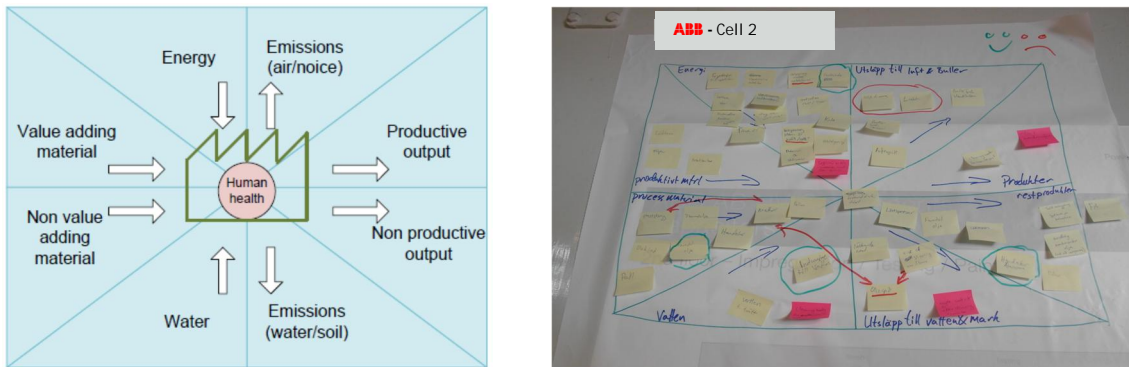


Figure 1. Left: The GPM model (Romvall et al. 2011), Right: The GPM model applied at Cell 2 at ABB.

Table 1. Environmental Key Performance Indicators developed for the two studied cells.

| Cell 1 | Cell 2 |
|--|--|
| Waste [kg] / Produced unit - Metallic waste - Polymeric waste - Scraped units | Oil used [L] / Produced unit Electricity [Wh] / Produced unit |

On one hand, it is important that the local ABB Business Units are addressing sustainability issues that are considered important on corporate level by the ABB Group. On the other hand, the opposite is also crucial i.e. developing and utilizing unique local KPI's to drive improvements should be positively recognized on corporate level. It is hence important that the developed local KPI's have a clear purpose and are in line with the global environmental targets. The ABB's environmental targets for 2012 were based on improved resource efficiency, with the main focus on energy use.

The present study also identified other factors that could be implemented in order to increase the overall engagement in environmental questions, such as:

- 1) To address environmental issues during the Gemba daily meetings
- 2) To delegate the responsibility of the environmental performance to the production line manager, i.e. to place responsibility on operations level rather than support level (environmental experts or similar)
- 3) To define environmental targets in the personal development plan of all employees.



DISCUSSION

Development and utilization of local KPI's – A concrete way to increase environmental engagement

Two different strategies could be used in order to increase the focus on environmental sustainability within an organization; either Top-down or Bottom-up. The decision to create a more environmental friendly product portfolio is an example of a Top-down strategy, while creating local KPI's together with shop floor workers is an example of a Bottom-up strategy. Bottom-up strategies are often more successful with regards to creating engagement among a larger number of employees, while Top-down strategies are more successful in altering the environmental profile of a company. Combining the both strategies is consequently the preferred approach of a multinational manufacturing group with the ambition of taking the lead within the environmental area.

The process used in developing the local KPI's was highly valuable for the environmental performance of the production line. The workers grew with the responsibility of setting the indicators that would measure their own performance. The study furthermore concluded that the GPM helped the workers to visualize their production cell in a way that supported the identification of environmental aspects and helped prioritizing among them, and eventually the planning and execution of relevant actions to reduce the environmental impact of the cell.

CONCLUSIONS

The main conclusions from this paper are summarized below:

- The process of developing local KPI's for the production cells lead to an energy boost for environmental improvement work at the Business Unit.
- The process of developing local KPI's could easily be included in the current structure ABB Sweden has for local organizational improvements.
- Green Performance Map was an appreciated tool, which was able to clearly visualize the input and output of the investigated production cell. It was also able to distinguish between value added and none value added resources.

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