

# Plant audits - Integration of performance measurements and best practices analysis

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## Abstract

The paper gives an inside view on a benchmarking project which was conducted by BIBA for a transformer manufacturer with several plants throughout Europe. It outlines the objectives of the plant audits, the methods and procedures used in the project as well as the results and the lessons learned.

## Keywords

Plant audit, best practice analysis, performances measurement, benchmarking

## 1 OBJECTIVES

The different plants of a transformer manufacturer having primarily the same production programme had to be compared by special plant audits. The objectives of the manufacturing network analysis can be seen in the following points.

- A well-supported assessment of the current situation concerning business processes, production technology, process organisation, and organisational structure
- An independent, technological and economic examination of the state-of-the-art of the production processes, production facilities and computer hard- and software
- Revealmment of optimisation potentials as well as the potentials of the partners in the group by direct comparison with the possibility of initiating activities for using these potentials
- Representation of the network strengths of the as a basis for a corporate strategic development
- Definition of improvement projects towards the "dream factory"

- Development of several manufacturing network scenarios, taking those possibilities into special account which arise by co-operation in the network. Definition of the list of measures to be taken.

In order to achieve these objectives and/or to perform such a network-wide assessment, within a very restricted time period, a systematic approach and appropriate methods had to be defined and selected at the beginning of the survey.

## 2 PROCEDURE FOR THE PLANT AUDITS

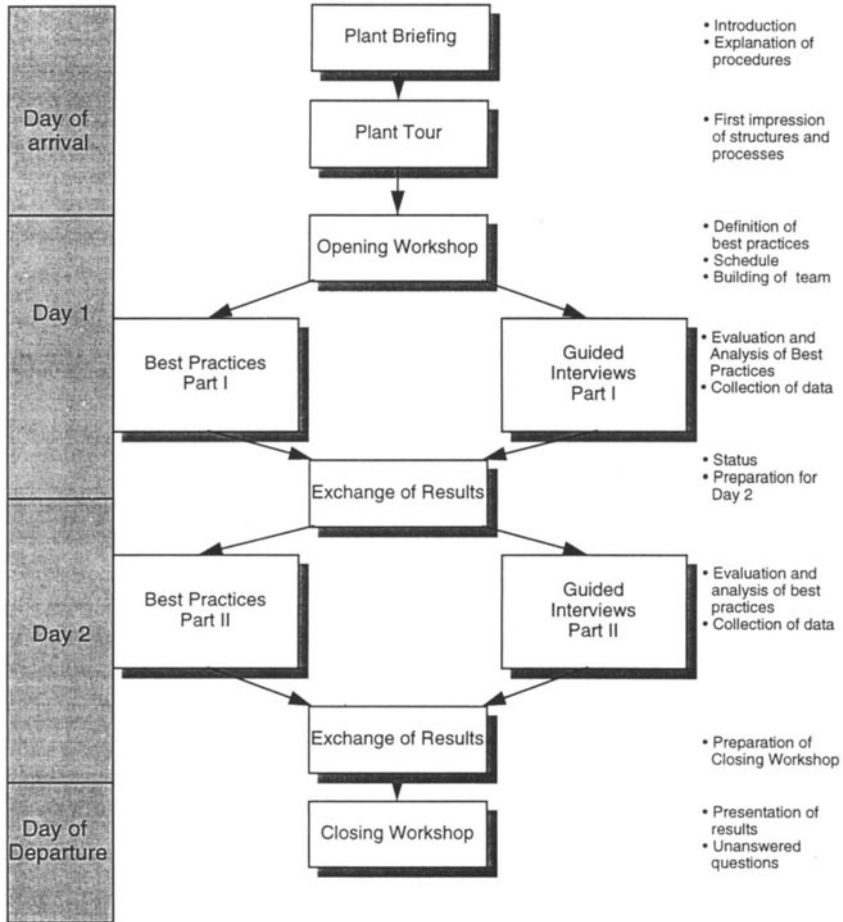


Fig. 1: Procedure for the plant audit.

Each of the plant audits, carried out by a benchmarking team composed of two company consultants and two research engineers from BIBA, had a duration of four days. All important information regarding the time schedule, the procedure and the objectives of each step of the plant audit is shown in figure 1.

During the short plant briefing the benchmarking team introduced itself, explained the project and its objectives and informed about the procedures for the plant audit. The subsequent plant tour helped the benchmarking team to obtain a rough overview about the existing structures, infrastructures and processes.

Goal of the opening workshop was the selection and definition of best practice processes as well as the building of the best practise teams. These best practice teams consisted exclusively of plant staff involved in the respective process. Participants of the opening workshop were both members of the plant management and representatives from the production departments.

The activities below were grouped into two main streams described in the following subsections:

- the "best practice analysis"
- the "questionnaire-guided interviews"

In the closing workshop the results of the plant audit were presented by the team. These results had to be confirmed, evaluated and, where possible, improved by the workshop participants. Also, the requirements for implementing the best practices were discussed in the closing workshop.

## **2.1 Questionnaire-guided interviews**

The intention of the questionnaire-guided interviews was to collect all the required facts by means of structured and efficient interviews in order to perform the plant assessment and to support the "best practices". Based on this information, specific codes and ratios in the sense of performance measurement were quantified.

The questionnaire was divided into two main parts. Part one consisted of questions regarding the general structure of the plant, for example the production programme, customers or the employee structure, etc.

The questions in part two were related to the following core plant processes:

- Purchasing of materials
- Development, design
- Order processing, PPC, material logistics
- and the four core production processes of this industry (core piling, coil winding, assembly testing area).

The interviews were scrupulously conducted in order to get detailed information for the questionnaire. The interview documentation included the completed questionnaire and additional information backing up the interview. The evaluation was presented with figures, rough outlines, comments and, where necessary, photos. The strengths of the plant were described and, based on the analysed information, the necessary actions to be taken were pointed out.

### 2.2 Best practice analysis

The major intention was to get detailed information about the best plant practices, to work out the specific potentials in the core processes and to document these processes in order to enable the adoption and adaptation by other plants. Additionally, these analyses had to define possible assets for future joint venture negotiations and build up the necessary trust between the staff and the benchmarking team. Due to the limited time allotment the analysis was confined to two processes. The procedure for determining and evaluating the best practice is shown in the following figure 2. The starting point was a detailed evaluation of the activities and/or tasks of the best practices.

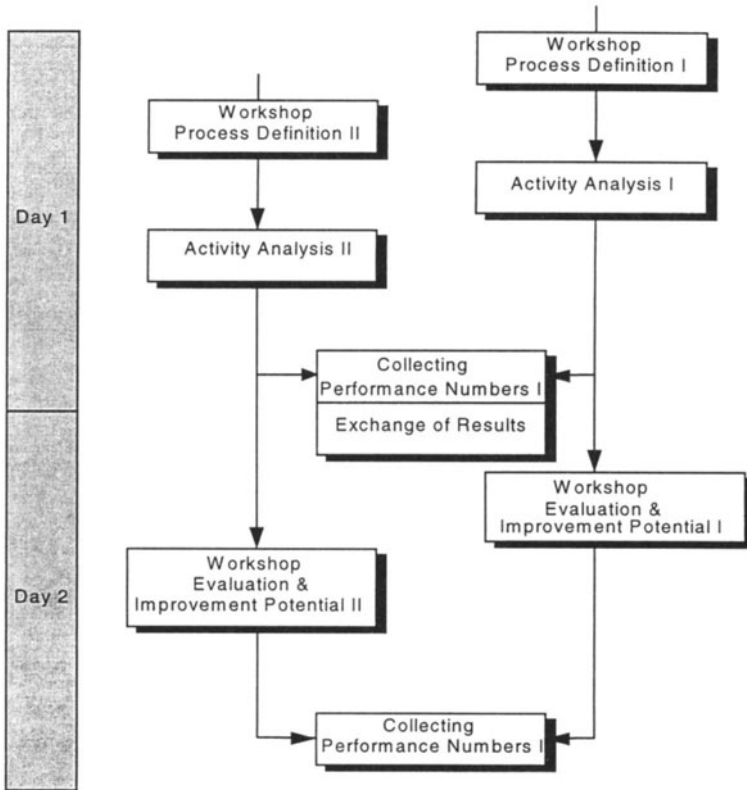


Fig. 2: Procedure for the best practice analysis.

The analysis of each best practice was done in a sequence of steps, starting with the survey of a process plan.

- Workshop "Process Plan": The individual activities of the best practice process and their relationships were defined in a workshop with selected plant staff members. The responsibility for the activity analysis of each activity was given to one plant staff member.
- Activity Analysis: The objective of the best practice activity analysis was to characterise and to specify the single process steps within the best practice process. It was based on the created process plan and investigated the activities concerning the following criteria:
  - Who is working?
  - What is the objective of the work?
  - What tools is he using?
  - How is he working?
  - What are the work results?
  - How long does it take?
  - What are the inputs?
- Key Data Capturing: Parallel to the activity analysis the key data of the specific best practice process was collected in interviews.
- Preparation of Results: The next step was to prepare the results of the "process plan" workshops and the activity analysis. The results were presented to the staff members at the beginning of the workshop "Evaluation and Potentials".
- Workshop "Evaluation and Potentials": To evaluate and confirm the results of the best practice analysis it was necessary to discuss them with the plant staff members. In closing, the group discussed how to improve the scope of the best practice and how to implement the best practice in other plants.

### 3 DETERMINATION OF THE BEST PRACTICE PROCESSES

To identify which business processes might be best practices, representatives of the plant staff met at a workshop moderated by a BIBA research engineer. To eliminate emotional and non-technical statements from the discussions as much as possible, the workshop was conducted according to the Metaplan approach (Eberhard Schnelle) with the moderator assuming a very unbiased role.

The idea was first to reduce the number of relevant processes by saying: "Only processes which support the core competences of a company can be best practice processes". Thus, the first step to find the best practices was to answer the question: "What are the core competences a transformer manufacturer must have to be successful on the market?". The written statements were collected and sorted in an open discussion. The results were nearly the same for all three plants:

- Customer orientation
- Customer contact
- Company strategy
- Qualified and motivated staff

- Innovative products
- Flexible processes
- Efficiency
- Modern, high quality production facilities
- Public relations
- Environmental protection.

In a second step the participants worked out which processes within their plants supported these core competences. The question was: "Which of the business processes in your plant supports these core competences?" Again, the written statements were collected and sorted in an open discussion.

Finally, each workshop participant was invited to personally rank the processes concerning excellence. In each case the average of the single votes led to the two best practice processes of the plants.

Process	Exemplary for	Indicators
Order Entry Meeting	Efficient gathering and distribution of information in order processing	Short order lead times, transparency of orders, well established direct communication, high flexibility concerning customer requirements
Insulating Part Production	Autonomous decentralized production areas	Minor delays, well loaded facilities, modern production facilities and infrastructure, small stocks, lean organization
Logistics/Purchasing	Co-operative order management	High degree of flexibility, high transparency, fast reactions
Coil Production	Flexible manufacturing cells	Flexibility, well-qualified staff, close co-operation with other departments, modern production facilities
Quotation Processing	Efficiency because of data re-use	Well-qualified sales staff, teamwork with design and manufacturing, high degree of technical know-how in sales department
Design	Organization of sketch near to sales department and detailed design near to production	High-quality products, development of new transformers without prototyping, few engineering change applications from production

Figure 3 Best Practice Processes.

## 4 LESSONS LEARNED

A critical review of the plant audits led to the following points with regard to strengths and weaknesses of the approach as well as possible improvements:

- The described procedure enables principle plant audits in a short time period.
- More information concerning the plants key data is necessary in order to prepare the workshop for the best practice processes identification.
- Performance measurements corroborate the facts gained by the analysis and substantiate comparison results. Figures alone can only supply starting points for later evaluations.
- The performance measurement should start early and include the best practice processes in detail.
- The activity analysis during the best practise processes investigation must be performed very collaboratively with plant staff.
- Statements of staff members should be validated by provable statistics in order to prevent and/or detect palliation and wishful thinking.
- In such a restricted evaluation schedule the performance measurement analysis should be supported by an extra team for data capturing and sampling of documentation.
- The definition of performance measurements has to be clearly and unequivocally defined.

## 5 CONCLUSION

The approach integrating a performance measurement project and a best practices process analysis leads to a method for fast comparison of plants having primarily the same production programme.

The described plant audits delivered a detailed inside view concerning a plant's abilities. When the best practice analysis is used, the plant staff will be highly motivated to support these investigations. The results of the audits can be used as a basis for a strategic design process to combine the individual potentials of each plant towards a strong and competitive co-operation. The plant audits resulted in a list of calls for actions which can be summarised as follows:

- measures enabling the adjustment of core processes quality to the same high level in all plants
- measures guaranteeing the adaptation of best practices by other plants in the future
- measures implementing continuous plant comparisons of core processes based on performance measurements
- measures guaranteeing the coverage and improvement of best practices
- measures supporting benchmarking projects with competitors and/or other branches
- measures enabling the creation of a manufacturing network