

# Implementation of the Focused Improvement concept in outsourced production

- A study at Tetra Pak's suppliers of Distribution Equipment

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*This article is based on a study at Tetra Pak. The purpose of the study was to investigate how Tetra Pak could take the next step and implement the Focused Improvement concept at the outsourced production of Distribution Equipment, with a focus on the supplier Mastec Stålvall. The study presents how efficiency could be measured for guiding improvements efforts and its identified loss structure in the manual assembly system. An implementation plan for how the next step can be taken is presented together with the major gaps that need to be closed before taking this next step.*

*Keywords: WCM, TPM, Focused Improvement, manual assembly system, supplier development, outsourcing, Tetra Pak, Distribution Equipment.*

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## Background

Tetra Pak delivers complete solutions for the processing, packaging and distribution of food products. Their products include packages, processing equipment, filling machines, distribution equipment and service products. Since it was founded in the early 1950s, it has become one of the worlds leading manufacturer in their segment.

The production of distribution equipment at Tetra Pak is outsourced to 18 suppliers worldwide. Different suppliers produce different distribution equipment machines, such as cardboard packers, straw applicators, palletizers and conveyers. The distribution equipment machines are assembled and tested at the supplier site to later be shipped to the customer. An improvement project for the distribution equipment was started in 2009. The main objectives were to regain control over quality and improve speed in the "from order to performance" lead-time for the distribution equipment.

Two major gaps were identified in the Order To Dispatch (OTD) lead-time. No available OTD data existed and there were no existing lead-time standards and procedures to control them. This resulted in the establishment of a data collection system for the OTD lead-time later that year. Figures were showing the need to start improving one of the distribution equipment machines, CBP 30 speed, to be aligned with other distribution equipment. Later that same year

a Takt system was implemented at several suppliers to better leveling the orders. Furthermore, a Standard Operating Procedures (SOP) sequence system was implemented as the first time standard to produce distribution equipment at some of their suppliers, among them Mastec Stålvall the supplier of CBP 30 speed. The next step in the development of Mastec Stålvall has been identified as to spread Tetra Pak in-house capabilities in terms of WCM and the TPM methodology for continuous improvements. Several of the eight pillars in Tetra Pak's WCM would be possible to implement at the suppliers. One of the first pillars to be implemented is the Focused Improvement (FI) pillar that is focusing on systematically identify and eliminate target losses to enhance the overall production efficiency<sup>1</sup>.

## Problem Discussion

Tetra Pak has identified several measures and procedures related to the FI pillar in-house that drive efficiency improvements. This study will investigate and describe how an implementation of the FI pillar measures and procedures could be designed at the suppliers of distribution equipment. However, an implementation of this kind would have some problem associated with it. For example, the suppliers not being an integrated part of Tetra Pak's organization

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<sup>1</sup> Ahuja & Khamba, (2001)

raise questions such as commitment issues and willingness to change, both key factors in any implementation of new management methods. But still the relationship between the two organizations is not purely a customer-supplier relationship rather of a more partnership structure. This leads to some interesting aspects of how to handle the implementation.

Furthermore, the fact that the production of distribution equipment consist of mainly manual assembly activities result in a complex problem in terms of process measuring. The Total Productive Maintenance (TPM) methodology was founded upon a machine based production situation whereas measurement is a more natural part of the process. In manual assembly lines the measurements and collecting of data provide a far more challenging approach.

The main question to be investigated in this study is.

- How can Tetra Pak take the next step and implement FI measures and procedures at the outsourced production of distribution equipment?

The questions stated above can be divided into separate sub questions.

- Is the foundation for an FI pillar implementation sufficient today at Mastec Stålvall?
- How would efficiency be measured at the outsourced production?
- What losses exist in the outsourced production?
- What are the gaps that need to be closed before the next step in a FI pillar implementation can be taken?

The purpose of the study is to provide an implementation plan for how the next step could be taken to implement the FI pillar measure and procedures at the outsourced production of distribution equipment, with a focus on Mastec Stålvall.

## Method

This study is based on a system approach since the implementation of the FI pillar is not just a single sub part problem. With the use of the system approach synergy effect could be taken into account and the search

for a problem solution that work in practice. This is crucial to allow the result coincide with Tetra Pak's current way of working. Since the study has been conducted from the inside studying behaviors and actions the author has used a qualitative approach. In the study both primary and secondary sources has been used. It includes literature review, content analysis, interviews, and observations. To get a deeper understanding and be able to understand the gaps, observations of Mastec Stålvall's production system was critical for the success of this study.

An inductive approach has been used in this study as the main analysis approach. However, some influences of deductive approach have been used as well during the construction of the empirical framework. Besides the logical reasoning methods of induction and deduction, gap analysis was identified as the central part for reaching the objectives of the study.

The validity is expected to be relatively high. However, the reliability of this study can be considered relatively low considering that the studied object is dynamic and constantly changing. But with the purpose of creating an implementation plan it will be used as a background for such an implementation.

## Theoretical framework

In this study several theoretical areas are studied. Concepts and terms related to TPM have been studied with a focus on the FI pillar, the role of efficiency measure, and losses<sup>2</sup>. The wider area of supply chain management<sup>3</sup> and supplier development<sup>4</sup> has been covered to give a broader understanding of the complexity of this kind of initiative and identify possible issues that could occur. Furthermore, process measuring<sup>5</sup> and data collection<sup>6</sup> has a central part in this study and is a part of the theoretical framework as well.

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<sup>2</sup> Nord, Petersson, & Johansson, (1997)

<sup>3</sup> Handfield & Nichols, Introduction to Supply Chain Management, (1999)

<sup>4</sup> Handfield, Krause, Scannell, & Monczka, (2006)

<sup>5</sup> Bellgran & Säfsten, (2010)

<sup>6</sup> Ljungberg, (1998)

## Findings

The foundation for a FI pillar implementation at Mastec Stålvall has been identified to be sufficient. Several aspects of the supplier development initiated by Tetra Pak have created an assembly environment where losses could be systematically identified and eliminated. Indications of commitment to further develop the collecting of losses on a management level have also been observed at Mastec Stålvall, which is crucial to be able to take the next step.

To measure efficiency in a satisfying way an overall efficiency measure based on a predetermined standard cycle time would be preferable to establish. This would minimize the risk of not collecting all losses impeding the overall efficiency of the assembly system, thus create an inducement for the suppliers to in fact collect all losses. The author has proposed two measures that would drive efficiency improvements at the outsourced production. First, the assembly system efficiency measure based on Tetra Pak's in-house efficiency measure Overall Operators Efficiency but has been modified to suit the requirements for the outsourced production and an initial implementation. It is intended to be applied on a system level as depicted in figure 1 and capture all losses that impede the overall efficiency of the assembly system.

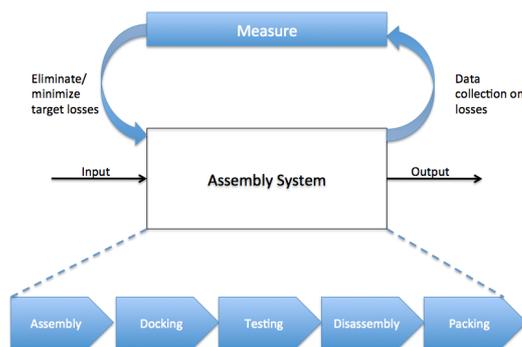


Figure 1. Efficiency measure on a system level

The loss structure related to the efficiency measure and the FI pillar are listed in table 1. All loss types are collected except for the speed losses that are calculated through the measure. The groups are related to different losses impeding the efficiency in terms of reduced availability, utilization or quality. Each group consists of a set of classes and its related loss types. The families of losses are constructed to support the quality

improvement system with the collection of nonconformities already established at the outsourced production by Tetra Pak.

The second measure proposed by the author is measuring on a sequence level in Tetra Pak's defined SOP sequence system. The loss structure is the same but the calculation of efficiency differs somewhat. It is first and foremost used to meet the requirements for an initial implementation at a sequence level and would also facilitate the tracking of speed losses on a sequence level. However, it is important to point out that there are some issues with using this measure. There is a risk of creating a "we-against-them" attitude between the assemblers at different sequences and a risk of sub optimization. Thus it is intended to be used in an initial implementation phase.

The data collection has been identified as the biggest challenge in an implementation phase of the FI pillar. The data on losses are today collected to some extent at Mastec Stålvall. However, four major gaps were found at Mastec Stålvall that needs to be closed to implement the efficiency measure at Mastec Stålvall.

- What sequence the loss was related to is not yet fully implemented but are in the implementation phase.
- The measuring of time spent on losses is not accurate enough to enable satisfying guidance of improvements based on these time values.
- The loss types existing today do not capture all losses impeding the efficiency and does not enable a sufficient loss deployment.
- The knowledge among the assemblers about collection losses is inadequate.

## Implementation plan for the FI pillar at Mastec Stålvall

The implementation of the FI pillar has been divided into three separate phases as shown in figure 2.



Figure 2. Implementation of the FI pillar

### *Preparation phase*

To ensure a successful implementation of the FI pillar several aspects need to be established before an initial implementation. The following activities have been identified to be included in the preparation phase before an initial implementation is initiated.

- Create a steering committee with Tetra Pak involvement to ensure a long-term focus for the implementation process.
- Alignment of the efficiency measure with the suppliers performance measurement system due to the fact that a great deal of focus will be placed on the measured assembly system when implemented.
- Establish the right standard cycle time for the outsourced production of machines. This means that the standard cycle time also needs to be separated from the business side of the supplier-buyer relationship to allow adjustment. Hence create the possibility to reveal the true efficiency and capture all losses.
- The work with eliminating or minimizing target losses has to be undertaken immediately and strongly so results can be proven quickly in an implementation phase. Otherwise there is a risk that the implementation loses its momentum. Tetra Pak's has to transfer their in-house know-how on how to organize for the FI pillar, its effective tools and methods, and how to work with reducing target losses to supplier.
- The gap in knowledge among the assemblers existing in the current data collection at the supplier Mastec Stålvall need to be closed before an initial implementation. Thus the supplier needs to ensure that a sufficient level of knowledge is established among the assemblers to collect losses.
- Introduce the overall efficiency measure to visualize the true potential of improvement at the supplier. It is also essential to follow the efficiency on a system level when later introducing the data collection on the pilot sequence due

to the risk of placing too much focus there initially.

### *Initial implementation phase*

Due to the complexity of a FI pillar implementation on a system level the author suggest the next step should be to run a pilot sequence. This phase is an initial implementation phase to set data collection procedures and identify problems that might occur in the initial implementation.

1. The magazine sequence has been identified to have several features that make it suitable to act as a pilot. The author proposed an initial manual data collection procedure with the use of a paper form and start-and-stop timers. Having the same loss structure as on a system level would foster good data collection procedures with the assemblers.
2. Evaluate the pilot sequence and run additional pilots in other parts of the assembly system if needed to identify problems that might not be found in an assembly sequence, e.g. the final testing sequence.
3. If there is a top-down commitment at the supplier, a development of a less time-consuming but still accurate data collection system should be initiated on the basis learning gained from the pilot sequences. The author believes that neither the data collection on a paper form nor the data collection system at Mastec Stålvall in its current design would facilitate these requirements.

### *Implementation on a system level*

The last step would be to implement the data collection system and capture the efficiency on a system level. Thereby in fact collect all losses impeding the overall system efficiency. This will create a focus on reducing the overall lead-time and the overall efficiency. A further development of the proposed loss structure would be possible to enable a more efficient loss deployment. Also to further develop the tracking of planned stop times would be valuable to be able to follow the time spent on these activities.

**Table 1. The proposed loss structure**

<i>Group</i>	<i>Class</i>	<i>Type</i>	<i>Family</i>
Availability	Breakdowns	Equipment failure	Internal
		Broken tools	Internal
	Lack of resources	Lack of equipment	Internal
		Lack of parts/components – material handling	Internal
		Lack of parts/components – not delivered from sub supplier	Internal
		Waiting for other sequence	Internal
		Lack of assembler to perform assembly activity	Internal
	Set-up	Missing tools at workstation	Internal
		Missing documentation	Internal
		Preparing workstation	Internal
	Unplanned activities	Unplanned activity from customer	Tetra Pak Market
Utilization	Speed losses	Speed losses	Internal
Quality	Rework	Wrong mechanical setting	Internal NC
		Wrong electrical setting	Internal NC
		Wrong component assembled	Internal NC
		Defect on part (internally)	Internal NC
		Deviation in specification (Internally)	Internal NC
		Defect on part (sub supplier)	Sub supplier (TP nominated)
		Defect on part (sub supplier)	Sub supplier (Supplier nominated)
		Deviation in specification (D&E)	Tetra Pak D&E
	Rework due to changes in configurations	Tetra Pak Market	

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