

## Executive Summary

Deliver your products on time is very important for a company operating in a market with Original Equipment Manufacturers (OEM) as customers. The OEM contracts delivery times towards their customers based on the delivery time you have promised. Also with large chemical plants as customers you can not afford to deliver you products later than promised. In spite of the fact that late delivery is unaffordable, Eclipse Combustion delivers their products too late. Only 32% of the total amount of orders is delivered on the contracted delivery date, 68% is delivered too late (see figure A). The low delivery reliability is experienced by the management of Eclipse as well as by the customers. From a customer survey came out that customers are unsatisfied with the delivery time consistency but value the consistency as a high importance issue.



Figure A: Delivery reliability of Eclipse Combustion BV

Eclipse Combustion BV is a company that engineers, assembles and installs burners, industrial burner systems and burner control systems. The customers of Eclipse Combustion BV can be found in different markets; for example the glass industry, gypsum<sup>1</sup> industry, automotive, textile industry and the chemical industry. Eclipse Combustion BV distinguishes four different value streams in the supply of physical products, each with different characteristics:

- Standard Products
- Modified Products
- Small Systems
- Complex Systems

The Standard Products and Modified Products are more or less standard and can be selected from a catalogue. On the other hand the Small and Complex Systems are completely customer specific. The Small and Complex Systems have to be designed from sketch.

This research is carried out for Eclipse Combustion BV, aimed at improving their delivery reliability. The objective of this research is to quantify the performance on the delivery aspect, to identify the causes of the low delivery reliability and to design a solution to increase the delivery reliability. The focus of this research is on the supply of the Small and Complex Systems. The delivery reliability of the supply of Small and Complex Systems is much lower than the products and the sales amount is larger. In order to reach the objective the following research question is defined:

What are the causes of the low delivery reliability of Eclipse Combustion BV and how can the delivery reliability, with respect to the supply of Small and Complex Systems, be increased by designing a solution?

<sup>1</sup> gypsum is material mainly used in the building industry for the construction of the inner wall in Dutch: gips

The structure of the research corresponds to the MEDIC model, a model which can be used when business processes or business systems do not longer function as expected. The MEDIC model is the Six Sigma approach which is used within Philips. Six Sigma is a method which aims to improve the performance of a business system and to increase the customer satisfaction. Three important aspects of the MEDIC model are describing the current situation, analyzing the current situation and designing and implementing a solution.

In this research are distinguished three parts: describing, analyzing and designing. First the current situation of Eclipse Combustion BV is **described** and characterized. The business processes and the business process control are described. Thereafter **analysis** is used to identify the causes of the low delivery reliability. The causes of the low delivery are identified with the help of Performance Measurement and Late Delivery Project Analysis and analyzing the current business processes. After the identification of the causes of delays in delivery, a solution is **designed** which aims to improve the delivery reliability.

The **description** and visualization of the business processes is twofold. First to provide the management of Eclipse Combustion BV an overview of the business system there it is not available. And second to provide information for the cause analysis. In the description of the business processes is made a distinction between the order processing activities and the order fulfillment activities. Figure B displays a simplified overview of the business process of Eclipse, the order-flow and material-flow is shown. The order processing activities concern activities that are directly related to the handling of individual customer orders. This cluster of activities contains order quotation, order acceptance, order entry and order scheduling. The fulfillment activity is the physical activity to acquire the items requested through production, purchasing or stock retrieval, to pack them for shipment, to ship them and sometimes to install the items at the location of the customer [Welker, 2004].

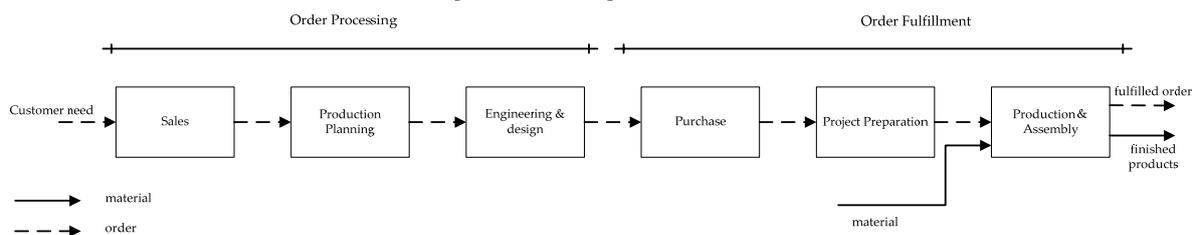


Figure B: Simplified picture of business processes of Eclipse Combustion BV

The analysis of the business processes shows that order acceptance activities are lacking. The delivery date is estimated instead of founding it on information about capacity and material availability. From the analysis of the current situation and theory about the Customer Order Decoupling Point is concluded that coordination between departments is very important in an Engineer-to-Order (ETO) firm, especially during the order processing of which the delivery date setting is part of. But there is minor coordination and communication between the departments in the order processing. An ETO firm is a firm in which all activities needed to supply a product are triggered by a customer order. Engineering, purchasing and production & assembly are all triggered by a customer order.

After the description of the current situation some **analysis** takes place, the analysis aims to identify the causes of the low delivery reliability. The two tools used for the identification of the causes are Performance Measurement and Late Delivery Project Analysis. Performance Measurement is used to judge the validity of formulated hypotheses with respect to the causes of low delivery reliability. The Performance Indicators which are identified are all factors which influence the delivery reliability: utilization of resources, internal delivery reliability, delivery reliability of suppliers, planning quality, delivery date feasibility and lead-time setting accuracy. The Late Delivery Project Analysis is used to identify causes on the lower level. Thirteen representative projects of Eclipse are analyzed in detail with respect to the cause of delay of the projects.

The Performance Measurement provides two important conclusions. One, the low delivery reliability is not caused by the high utilization of the production & assembly department. The capacity of the production &

assembly department is enough to fulfill the orders. Two, 54% of the contracted delivery dates is not feasible<sup>2</sup>. If delivery dates are unfeasible, the products can never be delivered on the contracted date.

The causes of the low delivery reliability are divided in two categories, causes related to the order processing and causes related to the order fulfillment. The most important causes are explained next. The unreliably delivery of Eclipse is the result of unfeasible contracted delivery dates. Unfeasible delivery dates are especially the case when project specific material (PRP) is needed. Unreliable delivery dates are the consequence of a lack of coordination and cooperation in the order processing. Information about needed material is not used to specify the delivery dates. Only the sales engineer is involved in the delivery date setting, a project manager or engineer is not involved in the currently organized order processing. Another frequently occurring problem is the unavailability of standard material due to late purchasing. This late purchasing is caused by wrong lead-time settings in the Material Requirements Planning (MRP). The Performance Measurement confirms that 20% of the lead-time settings are incorrect.

These causes and the current situation of Eclipse Combustion BV is the starting point of the redesign of the order processing and the improvement in the order fulfillment process.

In the redesign of the order processing is the need for more information taken into account. Reliable delivery dates can only be promised if correct information about the material availability and the capacity is available. In ETO situations the engineering department provides the material information, because the products have to be engineered first. Therefore the setting of the delivery date is divided in two phases. First a temporarily delivery date and an engineering delivery date is specified, after engineering and approval from the customer the final delivery date is set. After analyzing the effects of the redesigned order processing is concluded that the delivery reliability increases with 23%. The main characteristics of the redesigned order processing are:

- performing System Engineering (critical component selection) before the quotation and temporarily delivery date setting
- together with the quotation a temporarily delivery date and engineering delivery date is specified
- contract final delivery date after engineering activities and approval from customer

Because the project plan and the delivery date is specified after engineering a better estimation of the needed hours can be made.

The improvements of the order fulfillment are the following improvements:

- correcting the lead-time settings in the MRP system in order to purchase material on time
- registering receipt of material directly after receipt
- picking only non-reserved available material from the warehouse

Figure C presents the delivery date setting and the complete delivery time of a customer order in the new situation. As can be seen the delivery date is specified in two phases.

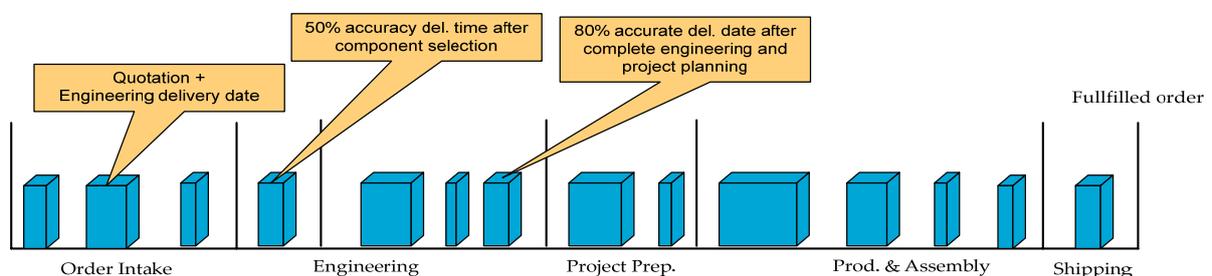


Figure C: Delivery Date promising in redesigning order processing

From the analysis of the effects on the delivery reliability is concluded that the delivery reliability can increase from 9% towards 78%. These figures are based on the data gathered during the Late Delivery Project Analysis. The 78% delivery reliability does not correspond with the objective of 95% delivery

<sup>2</sup> in Dutch: uitvoerbaarheid, realiseerbaarheid, haalbaarheid

reliability. It is difficult to incorporate the influence of the better estimation of the needed hours in the calculation of the delivery reliability in the new situation.

Eclipse Combustion BV should implement the redesigned order processing in order to be sure that the contracted delivery dates are realizable. During the implementation of the redesigned order processing it is important to bring together the production planner, the purchaser and the project manager in a material coordination unit. With the information about the lead-time of components (from purchaser), information about the utilization (production planner) the delivery dates can be contracted towards the customer. In the temporarily delivery date setting as well as in the final delivery date setting this material coordination unit is important.

A second important recommendation is to correct the lead-time settings in the MRP system in order to have the right material on time, a condition for delivering the products on time.