Chapter 17
Moving Towards BTO – An Engine Case Study

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Abstract. This chapter introduces a case study that focuses on a first-tier supplier delivering engines to several OEM vehicle plants. Assessing the global product strategy of the engine plant analysed and its OEMs, it could be foreseen that the current build-to-stock (BTS)-orientated production system will change to a more flexible, customer-orientated production system with fewer safety stocks and shorter lead times. To avoid large engine inventory and enable more flexible, cost-efficient production the supplier is urged to switch to a stockless BTO production and a just-in-sequence (JIS) supply of engines within 4 days of call-off. Consequently, the case study covers the challenges in implementing BTO at this first-tier supplier, i.e. the development and validation of a new logistics concept, including planning and material flow processes for production, supply concepts for engine modules, late configuration and JIS delivery concepts for engines. The visionary state for the engine assembly provides remarkable progress towards the BTO paradigm and demonstrates a real-world application of the BTO paradigm. Furthermore, it demonstrates the successful application of the guidelines and methods described in the chapters before.

17.1 Scope of the Case Study

The main objective of the case study is to support the implementation of BTO strategies at a first-tier engine supplier and to evaluate the potential and risks of applying such a customer order-orientated production system within a small time window between call-off and delivery. The second objective of the case study is to identify the requirements for the implementation of just-in-time (JIT)/just-in-sequence (JIS) strategies at eligible second-tier suppliers. The third objective of this case study is to analyse the potential of a combined static analysis and dynamic simulation approach for the evaluation of BTO scenarios.
The current processes at the engine plant and its OEMs, as well as the future BTO concept, will be described before the results of the case study are illustrated in detail.

### 17.1.1 Current State Processes

The European automotive OEM, supplied by the engine manufacturer under study, has BTO processes that are highly customer-orientated with regard to both their sales and production. The OEM’s objective is to ensure that the customer receives his individual vehicle on an agreed date, ideally a date requested by the customer. The minimum cycle time between vehicle order receipt and customer delivery is currently 10 working days. The customer should have the option to change certain specifications of his order up until a few working days before completion of the vehicle. One hundred percent delivery reliability to the customers is obligatory.

The process consists of three major sub-projects: online ordering, tracking and tracing within distribution and a new production system (the latter being the driver for the case study). The new production system builds upon the concepts of late order tagging, a frozen stable horizon and order-decoupled pre-fabricated painted vehicle bodies. The assembly sequence stability is guaranteed by a sufficient stock of painted bodies. This is achieved by producing a small number of bodies in each of the specific variants.

Thus, a longer stable horizon for planning and production is implemented within the process by freezing the sequence of orders from the point of order dispatching. Furthermore, this supports greater flexibility on the horizon before order dispatch. This benefits first-tier suppliers who supply just-in-time to the standard production request. This production request incorporates not only the final order, but also the requested date of arrival for a component and the sequence in which the components should be supplied. By setting the stable planning horizon, production and delivery lead time is extended considerably by this information enhancement – from a few hours in the past to 4 working days now.

The current logistics process at the engine supplier is split into two sections. The assembly of “base” engines with low numbers of variants follows a BTS paradigm. The late configuration process configures the base engines resulting in a high number of variants utilising a BTO process responding to the 4-day call-off from the vehicle plants. These processes are decoupled using a base engine storage centre, with an average inventory of up to 3 working days. The call-off of base engines from the storage utilises a standard production request. The late configuration process in the engine plant takes place in the sequence required by the vehicle plants. In the current logistics process, the late configuration is the order penetration point.