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Extended Multi-Customer Supplier Parks in the Automotive Industry

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Abstract

One great challenge for OEMs is to manage the complex supply processes. In order to reduce this complexity, they could integrate large suppliers into so-called Automotive Supplier Parks. In the end, large suppliers would have many small one-to-one plants in Supplier Parks with low economies of scale and high costs. This paper illustrates the key problems of traditional Supplier Parks and presents a new solution: the concept of Extended Multi-Customer Supplier Parks (MCSP+). Requirements, logistic processes and structures will be explained. Furthermore, the paper will present an approach to integrate suppliers in an MCSP+ that are not located in a Supplier Park.

Keywords:
Logistics, Integration, Supplier Parks

1 INTRODUCTION

Central and Eastern Europe (CEE) play a leading part in the development of the automotive industry, being one of the fastest growing manufacturing regions where more than 3,000,000 vehicles will be produced by local plants in 2008 [1]. This setting up of new structures opens up the opportunity to build innovative supply structures that cannot be implemented in Western Europe any more on account of the existing and historically linked production structures [2]. As a rule, production plant structures which have already been implemented and have been proceeding with high sums of investment and long-term contracts can only be altered with great difficulties: the service life of manufacturing plants that cover several decades is nothing extraordinary.

Especially over the last few years the establishment of suppliers in the immediate proximity of the original equipment manufacturer (OEM) plant or directly within a Supplier Park have been implemented by the car manufacturers on account of structural measures. This action had to be taken in order to meet the challenges of the logistics because of the out-sourcing of modules and systems on the suppliers paired with a Just-in-Time (JIT)/ Just-in-Sequence (JIS) delivery [3]. Particularly on account of the proximity to the OEM, an improvement of reaction time, of the production speed passing through duration, of the delivery performance as well as a reduction of stock of finished products will be achieved [4]. Scientific research, however, shows that Supplier Park and related structures are more effective in comparison with spatially divided structures of suppliers around an OEM assembly plant [3-4].

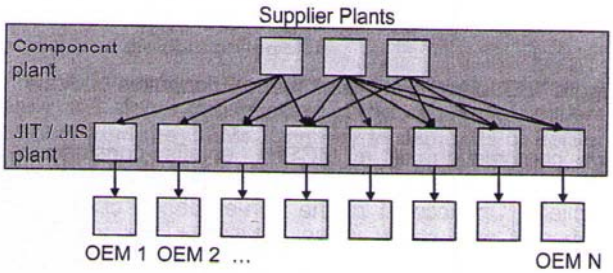

Figure 1: Production Structure of a Supplier.

Apart from the distinctive advantages, the building and operation of the JIT/JIS plants, tailored to customers' personal requirements, also causes a great number of challenges for the supplier. The greatest problems are the uncertainty related to the future delivery of quantities, because of the increasingly difficult process of prognostication, and the non-contractually guaranteed quantities, as well as the missing critical volume for the economically maximum operation of the JIT/JIS plants [5-7]. The plants are built with the least possible investment in order to minimise the risk factor and they mainly carry out sequential operations and low-key value production. Undesired complex production networks from several locations, consisting of component plants and numerous mini-plants are the subsequent result (Figure 1).

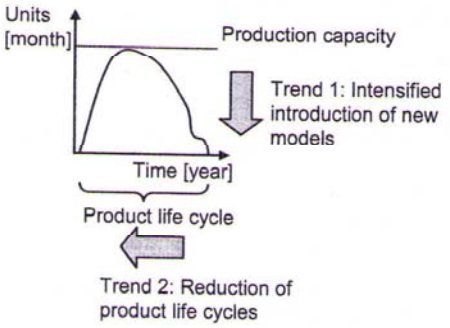

Figure 2 Trends concerning JIT/JIS plants.

The strategy to build JIT/JIS plants within an availability-driven production strategy, where the actual production capacity must be adjusted to the merely temporary demanded highest amount, in order to satisfy the high demands of the clients with respect of the guaranteed supply, is further worsened by the following trends (Figure 2) [8]:

Trend 1: The intensified introduction of new models continues to make the economic setting up of the JIT/JIS plants more difficult as on the one hand new niche models show small production volume and on the other hand, the sale of volume models thereby decreases in favour of the new models.

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Trend 2: The incessant reduction of model life cycles within the car industry makes it increasingly difficult to amortize the completed investments by means of a model cycle.

Especially in the region CEE the spatially split production structure of the supplier causes a negative impact in terms of the logistics costs on the component plants in Western Europe as well as on the JIT/JIS plants in Eastern Europe. Apart from the suppliers' own production structures this also applies to the supply network which can to a great extent be found in the traditional markets of Western Europe [1].

Following aspects can be derived from that: If it is successful to build up a concept in CEE

- which breaks up the complex productions structures of the suppliers consisting of component plants and JIT/JIS plants,
- which clusters more asset production in the CEE and
- which takes advantages of spatially concentrated structures such as Suppliers Parks,

a considerably improved situation can be achieved in contrast to the present structures.

The Extended Multi-Customer Supplier Park (MCSP+), which is more closely described in the paper, is a starting point for a likely solution. The MCSP+ concept is based on the fundamental idea that spatially concentrated structures produce a higher productivity than spread-out compartmentalised structures.

2 EXISTING SUPPLY STRUCTURES

In practice intelligent supply structures have been successful in the European car industry. Apart from the loose establishment in the proximity of an OEM plant without a particular structure, (e.g. in an industrial area), the concepts Supplier Parks and Logistics Centres have been established since the beginning of the 90's [3].

A Supplier Park is a cluster of more than two suppliers located adjacent or close to a final assembly plant. The well-defined area includes buildings as well as infrastructure and is purpose-built in order to serve the assembly plant and the suppliers. An operator provides and maintains the whole Supplier Park. Objectives of parks are cost reductions and service improvements of the procurement logistics as well as protecting business relationships [9-10].

In contrast to the Supplier Park where suppliers themselves carry out low-key asset production activities for their parts, this will be undertaken by a logistics service provider (LSP) with a central infrastructure in a Logistics Centre close to the plant. The delivery of the parts to the assembly line of the OEMs is managed by a LSP catering for both supplier structures.

Numerous logistic success criteria from already established structures can be derived and adapted to the MCSP+ concept despite the different adjustment of OEM-channelled Supplier Parks and Logistics Centres which are in contrast to a spatial concentration of component plants that are in greater distance from the multi-customer-orientated MCSP+ idea: Clustering of inbound product flows in the parks (e.g. VW plant in Emden), clustering of park-internal logistical services, such as storage and sequential operations (e.g. GM in Ruesselsheim), central IT-systems for managing the logistics (e.g. VW in Hannover), clustering of the outbound product-flows.

The very readiness only to outsource logistic activities to an external LSP enables the exploitation of inter-related potentials. On account of experiences gathered from numerous Tier 1 suppliers, with Supplier Parks and Logistics Centres that are both in the proximity of plants, these concepts can be transferred to the MCSP+ idea.

3 MULTI CUSTOMER SUPPLIER PARKS

3.1 The Basic Idea

The basic idea of the MCSP+ is the supply of several OEMs from a region (e.g. within a radius of 400 km) of an intelligent supplier structure where several suppliers with component production are established. The intelligence of the MCSP+ is the increased productivity of the spatially concentrated structure in comparison with the spread-out compartmentalised structures with individual supplier locations, as well as the supply of more OEMs from this structure.

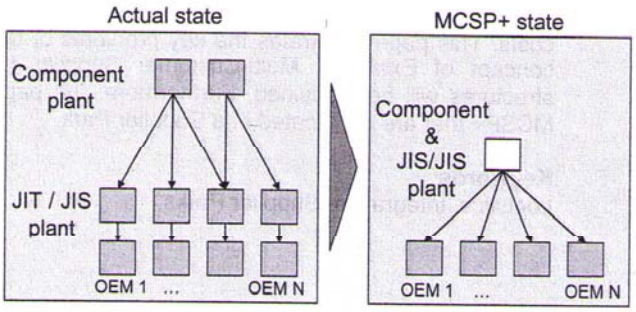

Figure 3: The integration of components and JIT/JIS Plants.

Three effects result from the concept:

- Due to the MCSP+ the construction of JIT/JIS plants is not required any more, the supply of the OEMs is centrally managed through a component JIT/JIS plant within the park (Figure 3).
- Synergy effects can be achieved through the centralisation of production cycles in one plant: improvement of productivity through increased output; flexibility of capacity through more customers; cluster effects through higher product volume (Figure 4).
- Due to the combined establishment of suppliers in a spatially concentrated structure and the transfer of logistic activities to the park synergy effects in the logistics can be opened up by means of increased amounts and clustering's (see Chapter 2).

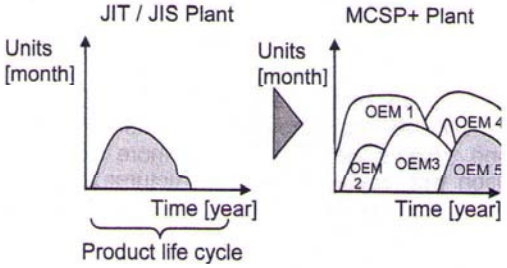

Figure 4: Capacity Equalization and Economies of Scale.

The construction of a MCSP+ entails considerable changes with regard to the plants structures of the suppliers. On account of the non-existence of a great number of new plants within a MCSP+, the realisable concept is mainly present only in regions of growth. Like in CEE where new OEM plants and subsequent suppliers' structures are built on account of Local Sourcing

Strategies of the OEMs [11]. The constructions of component plants in CEE reduces the transportation of parts across Europe, therefore decreases the logistic costs and utilizes the advantages of labour costs in the region. Apart from central locations within a region with several OEMs, also peripheral locations with special location factors (distinct advantages of labour costs, the most favourable logistical connection, e.g. through a port) can be considered. The arrangement of the concept implies two aspects under the influence of two system-theoretical underlying principles. Both structures need to be created and processes need to be put in place. Figure 5 depicts the structure and the logistic processes of the MCSP+.

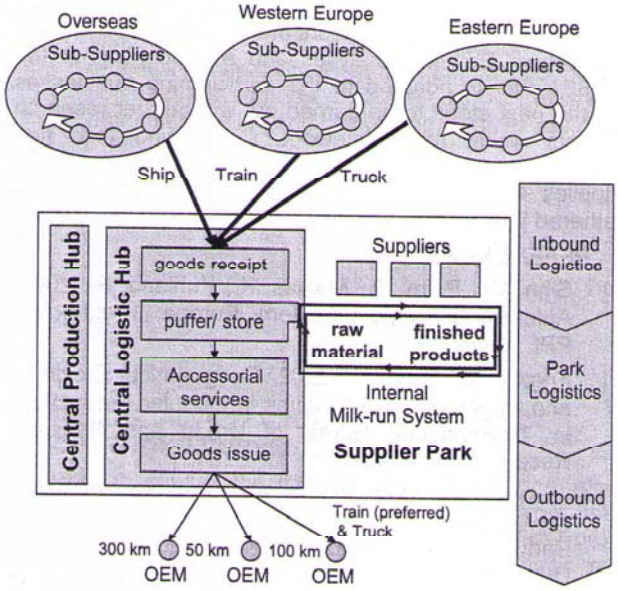

Figure 5: MCSP+.

3.2 Structure

The MCSP+ consists of:

- Suppliers which produce components in time for several OEMs.
- One Central Logistic Hub which is operated by one or more LSP and carried out the logistical operations for all suppliers.
- One Central Production Hub which carries out production services for all suppliers by means of centralised plants such as paintwork plants.
- One Central Park Operator that is in charge of the infrastructure (production building on a rental base, central building, services, etc.).

The global supply network of the MCSP+, divided into regions, is connected with the transport carriers: train, ship and truck. The integration with the OEMs which can be established some several hundred kilometres away from the park is managed through the transport carriers: train and truck. The LSP of the park are in charge of the supply and distribution logistics.

The fundamental pre-condition of this structure forms an early and stable transmission of the sequential requests coming from the OEMs. Contrary to demands of delivery with recalls of a few hours, a more stable "horizon" of several days is necessary because of the greater distance to the OEM, and the more complex value productions steps within the plants. The KOVP concept of BMW as well as the pearl-chain-concept of Daimler-Chrysler makes this possible [12]. Similar concepts however have not been implemented all OEMs yet

3.3 Logistic processes

The spatial concentration of suppliers within the park and thus the possible clustering of the complete logistical operations allow the formation of logistical processes with maximum performance (delivery time, competence of delivery, flexibility of delivery, etc.) at minimal costs (transport costs, handlings costs, stock costs, etc.)

The logistic process is divided into 3 partial processes, namely Inbound-Logistics, Park Logistics and Outbound-Logistics.

The **Inbound-Logistics** uses a multi-step logistic system with consolidation points for the different supply regions and also means of direct transportation. A combination of JIT/Vendor Managed Inventory and the classical stock supply is used for the inbound processes, dependent on the part-volumes and part-values.

Within the park all logistical operations are clustered: a central depot (suppliers don't possess an own depot anymore) and a central IT-System with intersections to the clients, sub-suppliers and settled suppliers in the park. The central IT-System presents a key factor for the realization of the synergy effects. Furthermore the internal-park transport of goods is put into reality by milk-runs from the central depot all the way to the suppliers.

For the **Outbound-Logistics** the supply forms JIT/JIS with the transport carriers: train and truck are mainly used. The information- technological procedure of the relevant calls is managed by the logistical service provider through the central IT-system.

The consolidation of the goods flow from the sub-suppliers in the park and from the park to the OEM makes it possible to combine small loose transport goods of the suppliers with large more economic loose transport goods. Consequently, the costs of transport items, the item costs at the product entry and exit, as well as the stock in the entire supply chain are decreased [13].

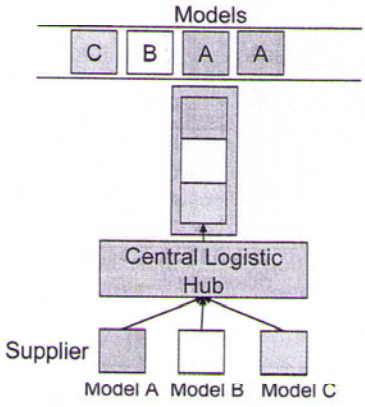

Figure 6: Conjunctions of Sequences.

Figure 6 depicts an example of an OEM plant, where 3 different models are produced on an assembly line. During this process one module (e.g. a cockpit) is supplied by three different suppliers. The concept of the MCSP+ makes it possible within the central logistics to build and deliver a sequence for a module which is supplied by several suppliers for several models. Therefore additional sequential operations can be avoided and space saving at the OEM can be gained.

4 EXTENDED MULTI CUSTOMER SUPPLIER PARK

The park requires a high volume of goods to achieve the realisation of saving potentials through e.g. the utilisation

of transport by train for cost reduction. Moreover, there is the opportunity for the not-in-the-park integrated supplier to improve the logistic performance and the logistic costs through an integration in the park.

Contrary to the ideas of Bitze [14], who can only envisage a virtual Supplier Park on the basis of a virtual cooperation, the fundamental idea of the concept is to create a win-win situation between the Supplier Park and the not-in-the-park integrated suppliers through a virtual integration of both parties.

By doing this, the physical production flows are managed by milk-runs and direct traffic flows; an integration in the central IT-system must consequently follow suit. Apart from the utilisation of the inbound and outbound processes of the park the additional efficiencies such as storage and sequencing can be used. Through the integration of material and information flows SME's which are settled in spatial proximity to the park can be used to take better advantage of the potential of the global supply market and to offer JIT/JIS supplies for the OEMs.

Beyond that, the market offers the possibility for suppliers from further field to take charge of warehouse activities, low-key assembly operations and the entire logistic management. Suppliers turn to JIT/JIS suppliers despite the distance of several 1000 km.

5 SUMMARY

In this paper a new support structure the MCSP+ was presented to the car industry. The concept helps to master the problem of increasingly more complex production structures of suppliers in a more effective and efficient way. The existing complex production structures consist of component plants and numerous JIT/JIS plants, tailored to customers' personal requirements, in close proximity of OEMs or in a Supplier Park. While the independent setting up of a component JIS plants for suppliers causes difficulties for economic reasons, the MCSP+ offers this possibility through the opening up of cluster effects.

Advantages	Disadvantages
Productivity improvement and decrease in logistic costs through economies of scale	Loss of competitive leads, through uncontrolled outflow of know-how
Decrease in capital demand through joint investment	Risk of loss of organisational identity and loss of options for differentiation
Complexity reduction of the plants' structures (reduction of the JIT/JIS plants)	Increased logistic costs in respect of a settlement close to the plant
Reduction of interfaces for the OEM	Simplified change of suppliers for the OEM
Simple and flexible accessibility to resources	Loss of core competence through outsourcing
Inter-organisational learning and the development of cooperative core competences	Risk of finding insufficient workforce and risk of poaching staff

Table 1: Advantages and disadvantages of the concept.

The existing supply structures with inflexible processes that are directed towards an OEM are developed further by the concept through the provision of a combined logistics, infrastructure for component plants with consolidated supply processes, a central internal logistics and the JIT/JIS supply for more customers. Apart from the establishment of component plants in MCSP+ complex and critical supply processes, consisting of Tier 1, Tier 2 and Tier 3 suppliers can be continuously constructed. Moreover, the MCSP+ integrates suppliers that are not settled in the park and improve the logistic performance and the costs of the integrated suppliers (just SME's).

Apart from the advantage it is the very establishment of such a supply structure with a joint integration of several suppliers in CEE that involves risks as well (Table 1). Regarding the feasibility of the concept, considerable efforts still need to be made as a matter of consequence. The acquirement of OEMs and suppliers as well as the adaptation of different interests present some of the great challenges. Detailed analyses and a conception of the MCSP+ that is adapted to the participating businesses are the next steps to be carried out with further research projects within the framework. Concerning this, first experiences with a Supplier Park in South Africa which supplies 4 OEMs within a radius of 30 km have been gathered [15].

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