The Logistic Principles for Fast Flexible Strategy Design of the Company in Crisis Time

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The article deals with design of the logistic principles enabling an enterprise to create a strategy flexible in terms of business and marketing and stable and steady in terms of manufacturing. In order to create a strategy model the following principles can be applied: shortening the period of capacity planning combined with flexible planning, SYNCRO – MRP (Material Required Planning) principle, the application of forecasting in capacity planning, creation with partners of one of the cooperation forms such as supply chain, demand chain, lean supply chain, agile supply chain, leagile supply chain, and using the DBR (Drum Buffer Rope), APS (Advanced Planning System) and SCP (Supply Chain Planning) systems. The article describes application of this principle for model design of the flexible strategy for Chemosvit fólie a. s. company, and the results of this application in the crisis time 2009–2011.

Key Words: SYNCRO-MRP, capacity planning, forecasting, supply chain, demand chain
JEL *Classification:* C51, L1

Introduction

In the time of a crisis and uncertainty, the basic philosophy of management is to prepare a strategy for a shorter period and to modify this strategy based on changes in market conditions, i. e. to prepare a flexible model – fast adapting strategy (Yonshuang, Takala, and Malindžák 2009), the strategy of a fast and dynamic change. Usually, strategy should be prepared for a longer period of time as it globally focuses on strategic

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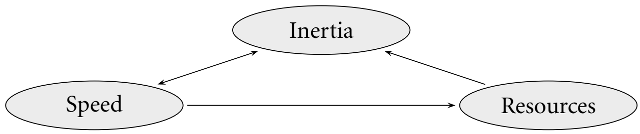

FIGURE 1 The relation of speed, inertia and resources (adapted from Yonshuang, Takala, and Malindžák 2009)

goals significant for the company. How dilemma can this be solved? (cf. Chandler 1962; Krawczyk 2008.)

If we do not adapt production strategy to the market changes and stick to some static strategy, it can lead to the loss of our market share and the loss of competitiveness. It is difficult to change technologies or to change manufacturing – this requires large-scale investments (Malindžák and Takala 2005). A more cost-effective and faster solution is to change the logistic principles and rules strategy of the enterprise so that it would be based on new organization, coordination, production planning, flows and chains.

The application of a 'fast strategy' is influenced by the speed of changes, by the inertia of the system and by the capacity of resources (see figure 1).

The speed of changes is the matter of selected processes, on which a strategy is to be built, i. e. those processes that will bring the most extensive and the most beneficial change at the lowest costs. Comprehensiveness and costs are proportional, i. e. the more comprehensive way a change is prepared and implemented, the bigger are costs required (Barros and Hilmola 2007).

There are logistic principles and approaches to the preparation of a flexible business and production strategy that arise from generally applicable models applied in Slovak enterprises, as described in the following article (Takala 2002).

The Principles and Approaches to the Preparation of a Flexible Strategy

The antagonism between manufacturing stability and market instability i. e. business/trade flexibility is characteristic for any crisis. The market forces the enterprises to adjust the performance for the following reasons:

- reduced volume of orders (some enterprises push down their business activities due to the crisis);

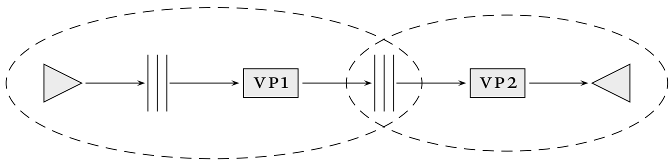

FIGURE 2 Syncro-MRP principle (VP1 – the first part of the manufacturing process, VP2 – the second part of the manufacturing process; adapted from Malindžák and Takala 2005)

- the increased number of small orders (enterprises are faced with orders of products in small quantities due to the uncertainty of orders they get from their customers);
- production is bigger than demand, companies trip each other up through their prices;
- product prices are reduced;
- productivity falls;
- insolvency increases.

Reduced uncertainty, higher manufacturing stability, uniform capacity utilization, maintained employment level etc., and at the same time maintained market share, due dates met, manufacturing productivity maintained, all these are the goals of enterprises in the time of a crisis. This dilemma can be partially solved by the following logistic principles and approaches.

SYNCRO – MRP

This strategy was applied in Toyota Motors Corporation for the first time. It is based on the idea of dividing the manufacturing process into two parts in terms of planning (see the figure 2).

VP1 – This manufacturing process is organized as make-to-stock production. It is mainly the production of universal parts and semi-finished products (e. g. clinker related to cement production), which is identical or similar for many products, i. e. planning is performed in the VP1 part by the *push* system, and planning is of a statistic and flexible type. VP2 – is make-to-order production, i. e. flexible towards customers, and planning is performed by the *pull* system.

The point of contact of these two logistic procedures e. g. A – is a break-even point. It arises naturally from the structure of production process, for instance VP1 – is parts manufacturing, and VP2 – is make-to-order production, which is flexible in relation to market requirements,

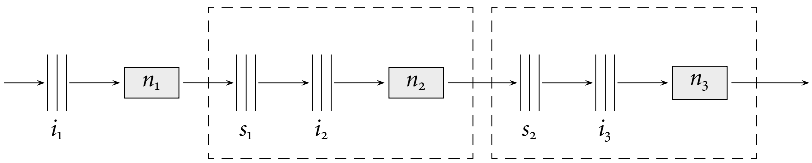

FIGURE 3 Supply Chain Application (i_1, i_2, i_3 – the entry warehouses of n_1, n_2, n_3 enterprises, s_1, s_2, s_3 – the exit warehouses of n_1, n_2, n_3 enterprises; adapted from Malindžák and Mervart 2010)

e. g. final product assembly. Warehouse A is often in front of the bottleneck of manufacturing process.

The volume of the inter-stage inventory of Warehouse A is based on a protective buffer. This for instance, means a weekly delay, i. e. the amount released from Warehouse A in week *n* for the VP2 manufacturing process will be scheduled for VP1 production for the following ($n + 1$) week, i. e. VP1 produces for the warehouse and at the same time for the orders considering the above weekly delay. This enables one, at least for part *A*, to maintain a stable and uniform manufacturing mode at the expense of higher inter-stage inventory in warehouse *A*.

SUPPLY CHAIN (SCH)

If the company does not have orders for several weeks in advance, one of the options for this situation long-term solution is to chain/link enterprises and to create a supply chain (Lambert 2008; Goldman, Nagel and Preiss 1995).

For example: enterprise n_1 receives or gains the manufacturing plan forecast of enterprise n_2, and n_2 enterprise will specify how big the stock produced by n_1 should be, e. g. in $t_1, t_2, \ldots, t_n$ period in the exit warehouse of n_1 company. The same will apply for n_3 enterprise, which will specify the volume of inventory for the same $t_1, t_2, \ldots, t_n$ period as in n_2 enterprise etc. (see figure 3). This will enable one to manage these enterprises in the long run and to increase the uniformity of production, to create optimum production batches, and to generate internal orders by accumulation of a larger number of orders for a longer period of time. This all, however, is just a forecast. As a part of this forecast, business is carried out on the basis of particular orders. The supply chain is mostly initiated by the companies with the strongest position in the chain or based on the agreement of all companies becoming a part of this chain (Gros, Grosová, and Dyntar 2009; Gros and Grosová 2004).

Lean Supply Chain

Lean thinking was conceptualized to apply to all activities in the firm and across the companies in the supply chain. Lean thinking in the supply chain is the use of lean principles to align activities across corporate functions within the firm and to manage business relationships with customers and suppliers (Lambert 2008).

To begin with, a lean supply chain seeks to reduce wastes found anywhere in the supply network, standardize processes across traditional, vertical organizations, and optimize core resources. Lean supply chains seek to create customer-winning value at the lowest cost through the real-time synchronization of product/service needs with the optimum supplier. Achieving such objectives requires the supply chain to be responsive (capable of meeting changes in customer needs for requirements such as alternative delivery quantities and transport modes) as well as flexible (adapting assets, pursuing outsourcing, and deploying dynamic pricing and promotions). Finally, lean supply chains are dedicated to the continuous improvement of people and processes throughout the extended supply chain (Ross 2008).

Abbott, Manrodt, and Vitasek (2005) identified six attributes of lean supply chain capabilities:

1. Demand management capability – an underlying tenet of the lean philosophy is that the product should be 'pulled' by actual customer demand rather than 'pushed' into the market;
2. Waste and cost reduction – in the broadest sense, waste can be time, inventory, process redundancy, or even digital waste;
3. Process and product standardization – it's important to develop standardization across both processes and products;
4. Industry standards adoption – standardization also needs to extend beyond a company's particular supply chain to the industry overall;
5. Cultural change competency – there is one recurring obstacle to successfully applying lean supply chain concepts, i. e. resistance from the people who will be asked to embrace and implement the change;
6. Cross-enterprise collaboration – through collaborative practices and processes, supply chain partners must work to maximize the value stream to the customer.

Agile Supply Chain

Agility is another concept often cited together with lean. Lean concepts work well where demand is relatively stable, and hence is volatile and where variety is low. Conversely, in those contexts where demand is volatile and the customer requirement for variety is high, a much higher level of agility is required (Christopher and Towill 2001).

Agility, as a business concept, was coined in the manufacturing context – particularly in relation to flexible manufacturing systems (Goldman, Nagel, and Preiss 1995; Nagel and Dove 1991). This concept was refined by Naylor et al. with a major focus on agility in supply chains (Naylor et al. 1999). By synthesizing representative agility definitions from several disciplines, Li et al. (2008) advance a unifying general-purpose definition of agility as follows: 'Agility is the result of integrating an alertness to changes (opportunities/challenges) – both internal and environmental – with a capability to use resources in responding (proactively/reactively) to such changes, all in a timely, and flexible manner.'

Christopher, Lowson, and Peck (2004) and Harrison, Christopher, and Van Hoek (1999) identify characteristics that a supply chain must have in order to be agile:

- *Market sensitive* – closely connected to end-user trends;
- *Virtual* – relies on shared information across all supply chain partners;
- *Network-based* – gains flexibility by using the strengths of specialist players;
- *Process aligned (process integration)* – it has a high degree of process interconnectivity between the network members.

Leagile Supply Chain

Naylor et al. (1999) coined the term 'leagile' to refer to hybrids of the lean and agile approaches. Here are three proven ways in which the concepts have been brought together to provide available and affordable products for the end customer (Christopher and Towill 2001):

1. The Pareto curve approach – the Pareto (80/20) rule, recognizing that 80% of a company's revenue is generated from 20% of the products. It is suggested that the fast-moving products that make up the dominant 20% of the product line can be produced in a lean, make-to-stock manner, given that demand is relatively stable for these items and that efficient replenishment is the appropriate objective.

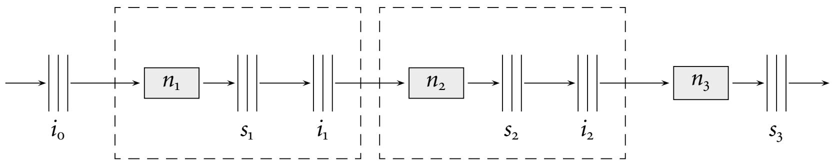

FIGURE 4 The principle of i_0, i_1 demand chain application (i_0, i_1, i_2 – the disposition warehouses of n_1, n_2, n_3 enterprises, s_1, s_2, s_3 – the exit warehouses of n_1, n_2, n_3 enterprises; adapted from Malindžák and Mervart 2010)

Meanwhile, the remaining 80% should be produced in an agile, less anticipatory manner, perhaps even employing make-to-order production to generate supply for only those items ordered when they are ordered (Goldsby, Griffis, and Roath 2006).

2. The de-coupling point approach – here the idea is to hold strategic inventory in some generic or modular form and only complete the final assembly or configuration when the precise customer requirement is known. Companies may utilise lean methods up to the de-coupling point and agile methods beyond it.
3. Separation of 'base' and 'surge' demands – base demand can be forecast on the basis of past history, where as surge demand typically cannot. Base demand can be met through classic lean procedures to achieve economies of scale, whereas surge demand is provided through more flexible, and probably higher cost, processes.

DEMAND CHAIN (DCH)

This philosophy has recently led mainly to bigger pressure from chain dominant enterprises that specify, for their sub-suppliers, the volume of products and the period ($t_1, t_2, \ldots, t_n$), in which the given volume should be either in a warehouse close to their premises or directly in entry, i. e. disposition warehouses. The above-mentioned goods will be owned by the supplier up to the moment of their release from the disposition warehouse. Once released, the following will take place: deal – order – invoice – payment to the sub-supplier. We would like to stress once more that the goods in disposition warehouses are owned by sub-suppliers, which forces each enterprise in the chain to make its sub-suppliers create i_0, i_1, i_2 dispatch warehouses on its premises (see the figure 4).

Each company in the chain has to require this from its sub-suppliers. Otherwise it will pay for the given warehouses (product cost, storage cost included) at the entry and at the exit of the enterprise itself, thus having a disadvantage compared to the rest of the demand chain (Gros, Grosová, and Dyntar 2009) DCH members.

Once the dominant or final company of the chain defines its requirements (demand) related to the volume of products available in sub-supplier's disposition warehouses for several scheduling periods in advance – as a forecast of its most probable needs, this logistic strategy will enable all the members of this demand chain to achieve benefits in the following aspects:

- optimum production batches, which can be formed when accumulating forecasted sub-suppliers' requirements for a longer period of time;
- they can produce temporarily to stock, when the given product is to be delivered in some of the coming scheduling periods;
- if the manufacturing capacity is not used in a sufficient manner, production can be carried out in advance;
- thus it is more stable and uniform and results in better manufacturing productivity;

It is important to maintain discipline in a demand chain, which can be embodied in bilateral or multilateral contracts for the entire chain. The question is how much of its capacity the enterprise will devote to SCH and DSCH.

The relations and obligations within SCH and DCH are beneficial as long as the enterprises in the chain function and fulfill agreements. This strategy is suitable when cooperating mainly with strategic partners. If, however, any of these strategic partners fall out of the chain for some reason, all its sub-suppliers, i. e. previous members of the chain, will face the consequences of their membership in the given chain, i. e. all of them will have insufficient coverage of their production capacities.

Therefore the enterprise should consider the extent to which it will devote its capacities to SCH and DCH in order to leave certain capacity for its new potential customers. The optimum volume of production capacity dedicated to SCH and DCH seems to be max. 60–70%. These approaches were optimal for the company Chemosvit fólie, a. s. This volume of the production is linked to four strategic partners. About 30% has to be left for irregular, small, new and potential customers. The mentioned 70% is a compromise between the stability from supply chain information of the future production and the risk of the volume of production capacity which is connected to supply chain. Small and new customers can became regular and big customers in case of losing some strategy partner.

Application of Forecasting in Capacity Planning

Capacity planning is based on the knowledge of particular orders for the relevant planning period, e. g. for a month, decade, week or available machine and equipment capacity in the relevant planning period. What should be done if the enterprise does not have a sufficient volume of orders well in advance, e. g. 3–4 days before a month starts, so as to effectively use its production capacity for the given month? (Kačmáry and Malindžák 2010)

One of the solutions is to reduce the uncertainty of the coming period by the application of forecasting methods (see figure 3), just like in the case of annual planning, for which we do not know all actual orders for the coming year. This idea was successfully introduced in the project of 'Capacity planning in Chemosvit fólie, a. s.' (Straka and Malindžák 2009). A part of the capacity, for which no orders are available, will be filled through the following:

- an estimate; forecasting orders that should be received during *t* period (figure 5);
- in the case when the production capacities are not fully used in *t* period by real and forecasted orders it is possible to use free capacity for manufacturing of the 'standard' products, regularly repeated in each planning period (these products are indentified from the historical data).

Thanks to forecasting applied in capacity planning, we will reduce uncertainty and indeterminateness related to material and utilities ordering and shift schedule preparation, etc.

These above specified problems have logically led to intensive search for new planning systems. They became known as Advanced Planning and Scheduling or Advanced Planning Systems (APS) and later as Supply Chain Planning (SCP) systems (Chopra and Meindl 2006; Schutt 2004). However, the scope of APS (SCP) systems is not limited to factory planning and scheduling, but has grown rapidly to include the full spectrum of enterprise and inter-enterprise planning and scheduling functions.

Unlike traditional ERP systems, APS systems try to find feasible, near optimal plans across the supply chain as a whole, while potential bottlenecks are considered explicitly (Stadtler and Kilger 2005). Three main

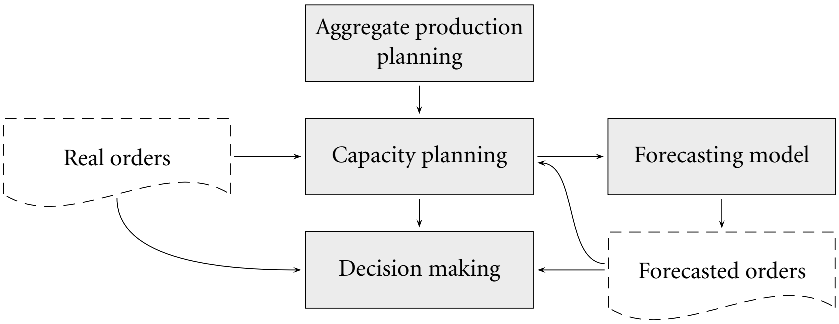

FIGURE 5 Forecasting principle introduced in capacity planning (adapted from Malindžák and Mervart 2010)

characteristics of the APS system are integral planning, true optimization and hierarchical planning system (De Kok and Graves 2003).

The APICS *Dictionary* (Blackstone and Cox 2005) defines the APS system as follows: 'Techniques that deal with analysis and planning of logistics and manufacturing over the short, intermediate, and long-term time periods. APS describes any computer program that uses advanced mathematical algorithms of logic to perform optimization or simulation on finite capacity scheduling, sourcing, capital planning, resource planning, forecasting, demand management, and others. These techniques simultaneously consider a range of constraints and business rules to provide real-time planning and scheduling, decision support, available-to-promise, and capable-to-promise capabilities. APS often generates and evaluates multiple scenarios. Management then selects one scenario to use as the "official plan." The five main components of APS systems are demand planning, production planning, production scheduling, distribution planning, and transportation planning.'

To conclude this full definition, the key success factors of the APS system can be summed up (Gruat-La-Forme et al. 2005; Šaderová 2010):

- A real time overview along the supply chain;
- A good decision-support package;
- Ability to sequence in real time, taking into account constraints in finite capacity, events or changes.

SHORTER PERIODS IN CAPACITY PLANNING

Another solution for the situation described, i. e. the volume of orders insufficient to fill the whole production capacity in the *t* period, has the

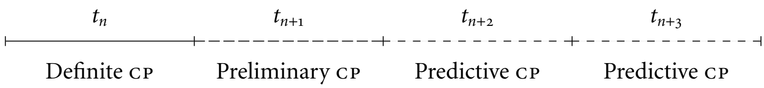

FIGURE 6 Planning periods – flexible planning

form of shorter t planning periods. It is common to prepare executive planning for a year period. The standard capacity planning period is a quarter, month, week, all based on the manufacturing cycle, the duration of delivery cycle, and manufacturing process inputs. The most commonly used is a monthly period. This means that for a crisis period the period of planning should be changed from one month to one week, i. e. to the period for which orders influencing manufacturing capacity are available in advance.

In order to maintain the advantage of the knowledge of long-term capacity planning (CP) (e. g. 1 month), the capacity plan is prepared in a flexible manner for each t_n week for the period of four weeks, supposing that each t_n week is definite, the second week, i. e. t_{n+1} preliminary (70–80% reliability) and t_{n+2} and t_{n+3} weeks are predictive. This enables one to order materials with a longer delivery cycle, prepare production etc. (see the figure 6).

DRUM-BUFFER-ROPE SYSTEM FOR SUPPLY CHAIN

Consider a supply chain defined by a sequential arrangement of the trading partners, each with statistical variation in its operations. One of the supply chain trading partners owns the limiting capacity. This partner is the system constraint (drum), and will limit the end-to-end output of the entire supply chain. To optimize output and system inventory, the supply chain must identify and manage a shipping buffer and a protective buffer as safety time against statistical variation. The supply chain, in addition, must connect the market demand signal to the system constraint and the starting work centres for each of the trading partners (rope) to send the synchronization signal. The DBR system is applied to 'synchronize supply with demand' (Walker 2002).

According to Gros and Grosová, the constraint (drum) becomes a point which directly drives the material flows of all partners within the chain. In essence, the pull principle is applied on the previous stages of the supply chain – the drum regulates the inputs in the preceding part of the supply chain, according to its requirements. The push principle can be applied from the drum onwards, because the following stages have

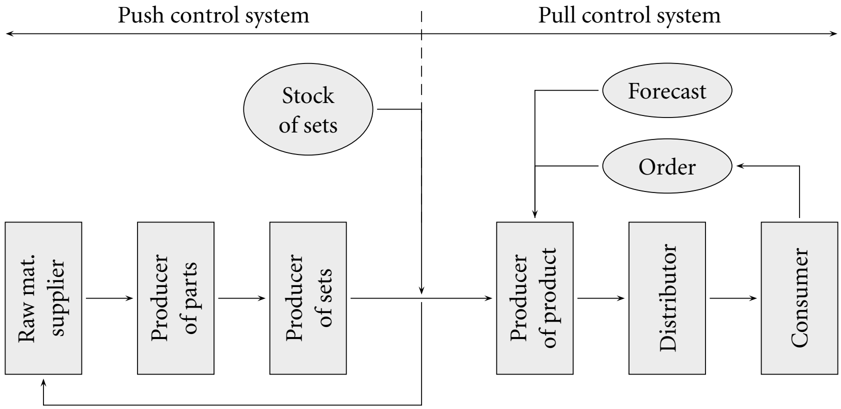

FIGURE 7 DBR system in supply chain (adapted from Gros and Grosová 2003)

higher capacity than the constraint, and the itemized plan of the drum respects the customer orders in the monitored period. The whole situation is described in figure 7. The final producer is considered to be the constraint (drum) (Gros and Grosová 2003).

Application of 'Fast Strategy' in the Conditions of Chemosvit Fólie, a. s.

Chemosvit fólie, a. s. Svit is an enterprise producing polyethylene and polypropylene packages. In 2008–2009, the principles described in chapter 2 were applied as a part of logistic activity re-engineering project based on the task of applied research in Chemosvit fólie, a. s. Svit. This was one of the factors of successfully overcoming the financial and economic crisis. The above applications in this enterprise are described in detail in 3.1 MRP Syncro Application.

THE SYNCRO MRP APPLICATION

Chemosvit fólie, a. s. is an enterprise producing a wide range of hygienic packages using the technology of gravure and flexographic printing. In order to withstand market pressure and to maintain the enterprise's market position, the flexible solution of strategy changes in various areas was required. Those changes are mainly dealt with in the field of logistics due to their promptness and investment intensity.

The implementation of orders for the segment of hygienic products consists of several consecutive manufacturing operations. First of all, it is basic foil manufacturing usually followed by foil printing. If required, lamination and film-coating can also be applied. The last operation is

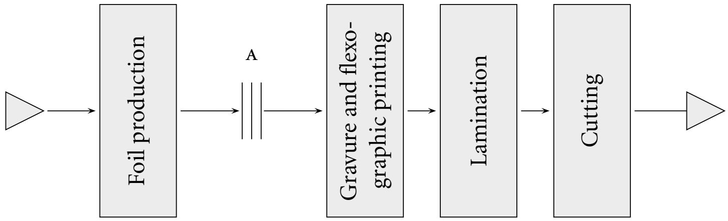

FIGURE 8 The simplified material flow of package production (adapted from Straka and Malindžák 2009)

cutting. If we want to increase the flexibility of production and deliveries it is suitable to focus on specifications of individual manufacturing operations. Unlike the first operation – where basic foil, which can be similar for several customers due to its size and specifications – is manufactured, the second operation, i. e. print, is the operation producing actual products for particular customers. Especially if a frame purchase contract has been signed for a longer period of time with one or several customers it is suitable to apply statistic make-to-stock production of basic foil. Even more precise planning of statistic production batches of basic foil can be carried out if the prediction of production batches of the customer is available through the Supply Chain Management system for a longer period of time (Rosová 2010; Bindzár and Mičieta 2005).

Such basic foil stock produced in advance can ensure shorter periods of order preparation and generally more flexible responses to customer's requirements. The original manufacturing process can be, in this case, divided into two parts: VP1 make-to-intermediary stock production, and VP2 make-to-order production. Thus one operation of order preparation is eliminated from the customer's point of view. As regards the effectiveness of production, the use of this system enables one to increase the volume of extrusion equipment production batches related to foil manufacturing, and machine availability, and also to reduce waste. A break-even point is a foil intermediary warehouse.

A CHANGE IN THE APPROACH TO CAPACITY PLANNING – FORECAST APPLICATION

At the time of reduced or floating order capacity, statistic orders are added to the portfolio of orders entering the process of production planning. Under statistic orders the following is understood: orders, which at the moment of their creation are not covered by any particular customer order. However, due to regular demands from some customers it is highly probable that such orders will be received in a short period of time. A long-term established database of business cases, good knowledge of the market and of customer behaviour are required for the preparation of a statistic order, where based on such data the forecast of future potential orders is prepared (Kačmáry and Malindžák 2010).

New orders, which are being prepared in cooperation with customers and for which no order was issued yet, due to some unclear data (which might not relate to the first part of manufacturing process), are also included in forecasted orders. In this case, the shorter period of launching new packaging material on the market, e. g. as a part of comprehensive marketing campaigns, is often of common interest.

SHORTER PERIODS OF OPERATIVE PLANNING

In order to increase the quality of capacity planning and production scheduling, Chemosvit fólie, a. s. introduced a new concept of production planning in 2008 (Straka and Malindžák 2009). Since the above project was carried out prior to the global economic crisis, the considered planning period was 7 days, which corresponded with both, the actual order capacity and frame purchase contracts signed by customers. At the end of 2008 the reduced activities on global markets showed that this suggested duration of the period did not suit the new conditions. With smaller average orders the pressure on delivery flexibility increased. Due to the reasons stated above it was necessary to shorten the duration of such period to 3.5 days (two periods thus form the whole week). The capacity plan was prepared in a flexible manner, i. e. each 3.5 days for 4 periods. 14 days for a customer order, material ordering, graphics preparation, etc. This enabled the company to react to changed conditions in a flexible manner since customer requirements related to delivery due dates were much more demanding in the time of crisis than the originally signed frame purchase contracts. The possibility of changing the duration of the planning period thus becomes a big advantage of new, integrated SW for production planning, which enables the company to adequately react to the situation on the market or to customer requirements/demands (Straka and Malindžák 2009).

SUPPLY CHAIN, DEMAND CHAIN, SUPPLIER MANAGED INVENTORY

The effort to reduce costs, increase continuity and reliability of the supply chain also in the packaging industry has resulted in the optimization of processes between suppliers and customers. Chemosvit fólie, a. s. currently carries out several forms of cooperation, the goal of which is to reduce administration on the customer's side, to optimize production on the supplier's side and, last but not least, to increase the flexibility and reliability of goods deliveries. As regards Chemosvit fólie, a. s., its customers are mainly international companies.

In the first case, it is a fully comprehensive system based on customer requirements/demands delivered in the form of long-term manufacturing plans. In order to achieve the above stated, Chemosvit folie, a. s. decided to develop an SW application, which will, apart from customer data import, also calculate and display the data given for the needs of an order logistics employee. Following consultation with a sales person, the logistics employee is held responsible for the specification of an optimum production batch and for the creation of a goods call-off proposal, which has to be delivered to the customer. The conditions of this system's functioning are agreed in an SCM contract, in which production and delivery windows are defined amongst other things. Once the proposal of production batches and customer call-offs is approved, the batches are included in the manufacturing plan. Of the stated predictions of customer production it is also possible to define the need of basic foils for these orders, which can be produced or purchased in advance.

Other forms of cooperation are basically derivations of Supply or Demand Chain systems, e. g. SMI, which deals with the preparation and implementation of goods call-offs, while the orders for production are still issued by the customer. It can be said, though, that SMI is basically an intermediary step leading to the full supplier and customer relation control that includes the management of both, production and dispatch.

Many customers combine the implementation of the above-stated systems and of electronic data exchange based on EDI protocol. This, in principle, enables direct interconnection of information systems leading to reduced elaborateness, lower error rate and overall increase of work productivity. Generally speaking, the systems managing supplier and customer relations can be regarded as a new generation of cross-enterprise collaboration, which is beneficial for both sides (or for all the companies forming the given chain).

Conclusion

The approaches described in this paper are logistic approaches to the creation of flexible production and business strategy, which have to be feasibly selected and combined. Their application mainly depends on the position of the company in the market, on the capacity used and on the position of the company in chains.

These approaches enable one to create a company strategy flexible in terms of business and relatively stable in terms of production, which is one of the possible ways to success in dynamically changing conditions, i. e. also in the time of financial and economic crises. Their application in the conditions of Chemosvit fólie, a. s. is described in chapter 3.

At the beginning of crisis time – the autumn 2009 – three years of applied research was finished. This research was focused on the models designed for the capacity planning and production scheduling in Chemosvit fólie a. s. The conditions of the market were radically changed at the moment of the delivered applied results.

1. Reduced average volume of orders – represented at time of printing (from 460 min. to 300 min.);
2. Increased number of small orders (but the preparation times for the printing were not changed and it resulted in a decrease of production effectiveness);
3. Solvency decreasing, increased numbers of customers not meeting liabilities about 30%;
4. The use of production capacities decreased below 80%;
5. Shortening of delivery time;
6. Unsteadiness of the capacity use was increased (from 60% up to 120%).

There was a need to react to the above situation and to prepare a fast flexible strategy (FFS). The global goal of the strategy was to successful survive the crisis. These are the described results of applied research at preparation of the fast flexible strategy based on logistic principles in this article:

A – application of Sincro MRP;
B – shortening of the capacity planning period;
C – application of forecasting for required due date determination;
D – supply chain application;
E – demand chain application.

The flexible strategy was oriented towards the following particular goals:

TABLE 1 The influence of individual principles A–E to the goals (I–V) and the results

Goals of fast flexible strategy – applied logistic princ.		Results in 2010
I Shortening of delivery time	A, B	Average delivery time was shortened from 21 days to 7–11 days
II Keeping the can be got to the scheduling process	A, B, C	Delivery performance was increased from 65–80%
III Increasing the use of capacity	A, B, D, E	From 80% up to 95%
IV Increasing the steady use of capacity	D, E, C	From 68–95% up to 90%–95%
V Change minimising in already planned production schedule and in-process production	B, C	From 21% down to 5%

I – shortening of delivery time;

II – keeping the required due date;

III – increased use of capacity;

IV – increasing the steady use of capacity;

V – change minimising in the already planned production schedule and in-process production.

Table 1 shows the influence of individual principles A–E to the goals (I–V) and the results.

Commentary on table 1:

- *Goal of point* I *– shortening of delivery time*
  Principle A: By the application of the Sincro-MRP principle production time was shortened by about one planning period (3.5 days) because foils are made-to-stock (figure 8), and gravuring, lamination and cutting will be realised in two periods, i. e. 2 × 3.5 days.
  Principle B: Orders with higher priority can be got to the scheduling process at latest after 3.5 days (previously it was 1 week): by this the production time for priority orders was shortened from 21 days to 7–11 days.
- *Goal of point* II *– keeping the required due date*
  Principle A: There are created conditions for fulfilling the delivery time by shortening delivery time by about one period. Because the delivery time is shorter, and terms in contracts are still the standard 14 (priority customers) or 21 days.
  Principle B: shortened scheduling time enables getting to the scheduling process earlier.

Principle C: At confirmation of delivery time of products in contracts and orders by the model of the capacity planning, the most probable delivery time is forecasred, and on this basis the required due date (RDD) is confirmed.

- *Goal of point* III *– increasing the use of capacity*
  Principle A, B: They were attracting customers who needed a short time of delivery by shortening of the scheduling time.
  Principle D, E: By signing contracts with regular strategic customers (Nestle, Kraft, Intersnack etc.), they obtained information – forecasts – about their production for the next 6–8 weeks. This enabled them, at times of an insufficient number of orders, to go to 'make-to-stock' production, i. e. to manufacture products in advance for these strategic customers.
- *Goal of point* IV *– increasing the steady use of capacity*
  Principle D: in spite of the fact that there was changeability ranging from from 60–120% in relationto the production capacities, steady use of capacity was achieved by the application of the supply chain principle and by dividing bigger orders into smaller parts and combining them with the production in advance.
  Principle E: the principle demand chain was applied for the distant trades (max. 5% of all orders).
- *Goal of point* V *– change minimising in the already planned production schedule and in-process production*
  Principle B: shortening of production scheduling time (3.5 days) ensured that also priority orders were not included in the production by the changes to the production schedule, but instead the regular scheduling process.
  Principle C: application of the capacity planning model as a forecasting model for the calculation of RDD and its confirmation increased the probability of its retention.

In this article the methodology and case study of preparation of a fast flexible strategy are described. The logistic principles of this strategy are not new, but their combination in problem solving is new. The new contribution can be considered as an application of forecasting to the capacity planning (calculation of RDD), not by using standard forecasting methods, but instead the model of capacity planning.

A good result of this fast flexible strategy can be considered the successful surviving of the crisis by the company Chemosvit fólie a. s.

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