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The Continuous Replenishment Technique for the Integration of the Supply Chain: the Electrolux-Zanussi Case Study

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Abstract

The paper shows that Continuous Replenishment is one of the main answers to Efficient Consumer Response, in the ambit of Efficient Replenishment, and is able to manage the supply chain not only in the grocery sector, but also in that of household electrical appliances. Taking Electrolux Italia as an example the implementation of this technique is analysed, highlighting the various processes (sales forecasting, capacity need forecasting, master planning, replenishment need calculation, dispatch planning, shipping), and parameters (target stock, replenishment need, dispatch plan, assigned stock, etc.) involved and the algorithms that regulate Continuous Replenishment. The paper points out the benefits obtained following the implementation of this technique and presents an attempt to extrapolate from this case the variables that define and characterise the conditions under which it can be applied.

Keywords:

Continuous Replenishment, Inventory Management, Supply Chain Management.

Introduction

The evolution of the present-day market and the change in roles and power within the sector have transformed competition between firms into competition between whole supply chains. Focusing strategy on improving the supply channel is the one and only road the firm can take to reach a greater competitive advantage.

The concept of *Supply Chain Management*, first applied to the textile industry as *Quick Response* around the beginning of the 1980s, has been affirmed in the literature. This innovative approach was then adopted in the alimentary, or more generally the grocery sector through the spread of *Efficient Consumer Response* (ECR). The theory proposes a re-planning of the supply chain acting on the various points of interface between industry and distribution (Figure 1), that is, the areas of efficient promotion, efficient assortment, efficient new product introduction and the logistic area that considers the supply process (efficient replenishment) (Kurnia, Swatman, 1998).

An intervention in this area, would be a significant lever to surmount the trade-offs between cost and service level and so increase the performances of the whole channel. One of the principal solutions proposed in this sphere is Continuous Replenishment (CR). It facilitates the implementation of other support techniques, the foremost of which is clearly EDI, then the bar code, scanner, CAO, cross-docking, multi-drop/multi-pick.... (for greater detail see De Toni and Zamolo, 2002).

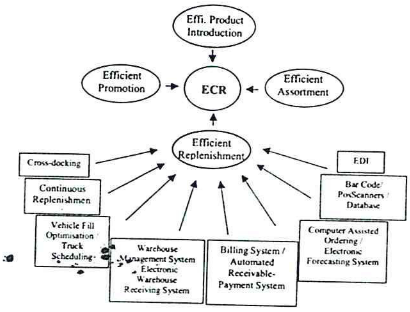


Figure 1. Efficient Consumer Response

The CR has revolutionised the traditional system of ordering and inventory management characterised by transferring purchase orders from the distributor to the supplier. In fact CR is a process of restocking where the manufacturer sends the distribution centre full loads whose composition varies according to sales and in conformity with a prearranged level of stock (Figure 2). The responsibility for replenishment thus passes into the hands of the manufacturer: in fact he decides the quantity to be sent on the basis of information regarding sales and the level of stock in the distribution centre, taking into account the orders already acquired by the outlets and following a pre-established programme of provisioning. The distributor, on the other hand, must guarantee a continuous flow of information to enable the manufacturer to formulate realistic order proposals and make reliable previsions. The key characteristics of CR are thus short replenishment lead times, and frequent, punctual deliveries that optimise production and transport planning.

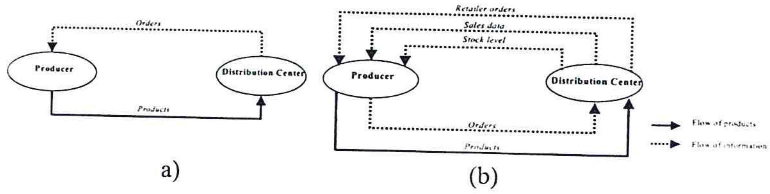


Figure 2. (a) Traditional replenishment system; (b) Continuous Replenishment

There are not many studies to be found in the literature that analyse the application of this technique, while those that do exist mostly regard the textile, food and grocery sectors. In spite of the fact that several obstacles hinder the spread of CR, linked on one hand to investments needed to reach a high level of integration between the partners, and on the other a critical trading volume, and the proximity of the parties, the technique has a strong potential in sectors other than grocery, where it first developed, and could be extended even to the upstream nodes of the supply chain. The evolution of the household electrical appliance sector in part mirrors the problems faced in the grocery sector (Cardinali, 1999) so it paves the way for the diffusion of this innovative approach. The case proposed is such an attempt. It points out how these ECR principals were received in the home appliance sector. Among the actions taken by the Electrolux group to improve efficiency and internal performance in the supply chain was the substitution of the traditional supply system with *Replenishment*. The latter is the name given by the group to the supply management model that follows the logic of Continuous Replenishment. It has been particularly successful. The system was first implemented to manage supplies to the sales companies then the same logic was extended upstream to manage the assembly chain suppliers. After presenting the mechanisms, algorithms and parameters that regulate the *Replenishment* between the factory and the sales companies it is shown how its adoption enabled the Electrolux-Zanussi group to extend the principles upstream and involve the producer firm and the suppliers. The analysis and comparison of the results obtained before and after implementation of CR, particularly in the Porcia factory, confirm the validity of the technique and the achievement of the theoretical objectives proposed by the ECR. Finally this paper extrapolates from the case all the variables that define and characterise the conditions under which the technique is applicable.

Mechanisms and processes of *Replenishment* in sales companies

The idea behind the use of the *Replenishment* method for sales companies (SC) is the pull concept: manufacturing and production must be pulled by the market, its trends, and seasonal nature, in other words the actual sales of the SC. These latter supply the firm with information relating to their orders portfolio, level of stock, and sales forecast, and the factory guarantees to cover a determinate level of safety stock (target stock-TAS). The same logic is the basis of the *Replenishment* process adopted between factories and suppliers: the latter aim to restore an agreed level of stock of components or subunits (TAS) calculated on the actual market demand. Here the analysis of the *Replenishment* process directed towards the SC is highlighted.

As can be seen from Figure 3 in this approach the actual orders placed by the SC with the producers disappear; in addition planning the quantity to be shipped to the sales companies, thanks to the Target Stock enables the peaks of absorption to be levelled out, which in turn permit a leveling of production, though the market demands are still carried out efficiently.

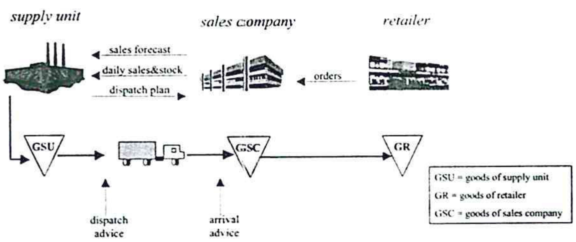


Figure 3. The process of Replenishment in sales companies

The Electrolux group has numerous factories and sales companies around the world; this justifies the groups decision to equip itself with a reliable information system that could transmit data to them. The system used is called the Electrolux Forecasting and Supply System (EFS-95), functioning on the I.B.M. AS/400 hardware package. Using this system sales companies and factories share the master data containing information on codes, prices and general characteristics of the products. This data is gathered in a common database which is updated by the producers. Inside the *Replenishment* system it is possible to individuate the processes, outlined in Figure 4.

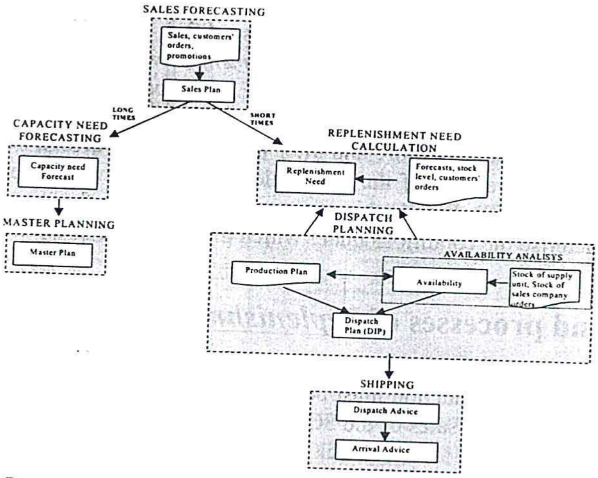


Figure 4. Processes involved in Replenishment

The SALES FORECASTING process is carried out by the sales company. They supply a forecast of future sales based on past data including past sales, commercial advertising campaigns and customer orders. There are two levels of forecasting: one for managing the long times and the other for managing the short times. The first defines the monthly needs of the SC in terms of macro aggregates covering the period of a year. These forecasts represent the inputs of the CAPACITY NEED FORECASTING where the medium - long term period production is defined. The data is shared with the SC and used in the successive MASTER PLANNING process. Here the demands of the plants, possible maintenance required, human and material resources needed are defined and programmed in greater detail. The latter are sent to the suppliers who are then able to plan their own demand. This process, like the former one, does not consider some data related to the stock, as it provides an advance projection of future sales and the relative adjustment of the demand without any reference to warehouse availability.

The short time forecasts are made on a weekly basis for each code and cover a period of 12 weeks. They represent the input for the process of the REPLENISHMENT NEED CALCULATION in which, for each code, the quantity of goods that must be consigned to the sales company on a certain day is calculated, so that stock is restored to a prefixed level and can cover a determinate sales period. The input for the calculation are data from the sales plan, the level of stocks in the sales company, the retailers' orders, and are dispatched daily, and from the sales forecast, which are dispatched weekly. In the following paragraph the logic and algorithms used in the process are explained in greater detail. Starting from the value of RN the factory determines the quantity of each single code to be consigned to the SC using a calculus of finite capacity, that is, warehouse availability and the production plan are considered. Whether the supply needed to cover the Replenishment Need exists is estimated on one hand considering the production planning and on the other the availability of products in that given period deduced using the sub process of Analysis of Availability. If availability is not sufficient to cover all the demands it is shared out proportionally between all the sales companies. The model schedules a two-week period of frozen production, that is a temporal horizon in which the production plans cannot undergo further modifications, and, if needed, a period of one week of frozen distribution during which the Dispatch Plan-DIP cannot be changed. Obviously during frozen production the DIP is confirmed and for the following weeks only the Replenishment Need is calculated.

In the process of ANALYSIS OF AVAILABILITY, availability of a product in the goods supply unit (GSU), is analysed in order to confirm the calculation of the RN. To do this a projection is made of the level of stock in the factory warehouse up to the end of the frozen production period ($GSU_{projected}$) considering the stock in the firm at the beginning of the frozen period ($GSU_{current}$), to which is added the quantity derived from Assembly Plan in the same period (AP), and the quantity of the Dispatch Plan made in the frozen production (DIP) netted.

$$GSU_{projected} = GSU_{current} + AP - DIP$$

Finally the DIP quantity, either produced or withdrawn is shipped to the sales company. As soon as the goods have been dispatched a Dispatch Advice is sent out which enables the measure of the stock in transit from the factory to the SC to be updated (GIT-Good In Transit-), and also warns the sales company to prepare to receive the goods.

The model of the *Replenishment* logic, described above, has been defined in a general way by the Electrolux Group. The distinctiveness and different flow needs of the single factories compels each to adapt the model to its own requirements, but still respecting the logic and the phases in which it is articulated. The algorithms that regulate the central phase of the *Replenishment* process are shown below, that is the determination of the quantity to dispatch to the sales companies, i.e. the shipping plan considering their implementation in the Electrolux plant in Porcia.

The use of the *Replenishment* model in the Electrolux plant in Porcia (Italy)

The Electrolux factory in Porcia began using the *Replenishment* model in 1998, adapting it to their particular needs and constraints. The factory uses the EFS-95 system as an interface with its sales companies, from which it receives the input data, while the calculation of the Replenishment Need and the DIP, central phases of all the processes, are made by a pre-existing local system.

Parameters and algorithms used in the Replenishment Need Calculation

TARGET STOCK (TAS): the calculation of the Replenishment Need starts from the definition of the Target Stock (TAS); this is how any unexpected fluctuations in sales are absorbed until the next arrival of goods. The factory then must plan supplies so that the SC warehouse contains a level that can meet the forecasted needs. The factory and the SC agree on the value of the TAS in days (TASdd), that is, the number of days covered by the supplies in the warehouse. That value is determined in function of the level of reliability of the forecasts of each code (in fact once a certain level of service has been decided a lowering in the reliability of the forecasting increases the level of safety stock) and reliability of the supplier and the frequency of restocking.

To determine the level of stock that the factory must guarantee to the sales companies, a calculation is made starting from the TASdd, its equivalent in pieces depending on the customer's needs calculated by evaluating a predetermined horizon of visibility:

$$TASpc = \frac{\sum_{i=1}^{n} forecast(i)}{n * d} * TASdd$$

where: *TASpc* is the Target Stock in pieces; *TASdd* is the Target Stock in days; *forecast(i)* is the forecast of sales in the ith period; n is the number of weeks of the temporal horizon (generally fixed at 4); d is the number of sales' days (fixed at 7); $\sum_{i=1}^{n} forecast(i)/n*d$ is the forecast of average sales per day during the period considered.

The system calculates the TASpc for 12 rolling weeks; therefore the firm must deposit input data for the needs relative to the following 16 weeks (in the hypothesis of no.=4).

The objective the factory and the sales company hold common is obviously that of reducing the level of stock and therefore the TAS. While variations in time of demand depend on the market and cannot be controlled directly, it is possible to react by increasing the reliability of supplies, the accuracy of the sales forecasts by the sales division and increasing the frequency of restocking.

REPLENISHMENT NEED (RN): the Replenishment Need is the quantity the factory must dispatch to the sales company so that the SC's level of stock at the moment of arrival of the goods is equal to the level of the TAS calculated for that period(Figure 5).

$$RN_i = TAS_i + Requirement_i - (GSC + GIT)_{current}$$

where: $GSC_{current}$ is the true level of stock in the sales company; $GIT_{current}$ is the goods in transit which will arrive in the SC; *Requirement* is the needs relative to the period considered i.e. the maximum value between the sales forecast and the sum of the back orders and the customer orders:

$$Requirement_i = max[forecast_i, (CustomerOrders_i + BackOrders_i)]$$

where *Back Orders* are the quantity of goods not yet evaded.

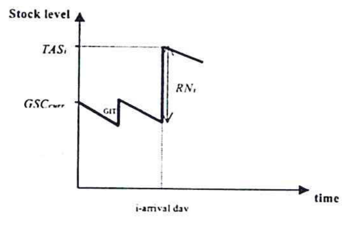


Figure 5. The tendency of the stock.

AVAILABILITY: by the analysis of availability, the firm establishes the quantity of goods it can provided and dispatch to its sales companies ($GSU_{assigned}$). That quantity is shared between SC managed by *Replenishment* and traditional order management. In particular the quantity assigned to the SC managed by *Replenishment* is proportional to the demand. The firm has chosen to consider the average of the RN of the four preceding weeks so as to avoid mistaken consignment resulting from peaks in demand that are above and beyond the normal supply flow.

$$GSU_{assigned_{i,k}} = GSU_i * \sum_{j=i-3}^{i-1} \frac{RN_{j,k}}{4} \Bigg/ \sum_{k=1}^{n} \sum_{j=i-3}^{i-1} \frac{RN_{j,k}}{4}$$

where: $GSU_{assigned_{i,k}}$ is the quantity of goods in a determinate code consigned in the i^{th} week to the k^{th} SC; GSU_{i} is the quantity of goods available in the i^{th} week for the SC managed by *Replenishment*; the $RN_{j,k}$ is the value of the Replenishment Need in the i^{th} week of the k^{th} SC;

The assignments for assembly are analogous.

The availability assigned to the SC during a fixed period is thus equal to:

$$DISP_{i,k} = GSU_{assigned_{i,k}} + AP_{assigned_{i,k}}$$

where: $DISP_{i,k}$ is the availability assigned in the i^{th} week to the k^{th} SC; $AP_{assigned_{i,k}}$ is the assembly plan assigned in i^{th} week to the k^{th} SC.

<u>DISPATCH PLAN (DIP)</u>: determining the quantity of supplies of infinite capacity (RN) and the availability of the code, it is possible to draw up the dispatch plan (DIP) which defines the quantity that is sent to the sales company by the factory evaluating the demand and the stock present in the firm (quantity of supplies of infinite capacity). The DIP is a rolling plan with a temporal horizon of three weeks, that is, every week the dispatch plan for the current week (W1), and of the folowing two weeks (W2 and W3) is renewed.

Let us now have a look how the calculation of the DIP is worked out in the Porcia plant which is characterised by a frozen productivity of two weeks and a null frozen distribution. In the first week of frozen productivity (i=1) (Figure 6) the calculation begins from the value of the Replenishment Need for that week (*RN1*) determined beforehand by the Replenishment Need Calculation: if the value is negative the system is automatically annulled so that no goods are dispatched to the SC, conversely, the system considers the availability assigned to the SC (*DISP1*): if it is higher than the RN1 then the quantity that will be dispatched to the SC (*DIP1*) is equal to the value of the RN1, otherwise a quantity equal to the availability assigned will be dispatched to the SC. After this calculation the quantity dispatched, either in excess or defect (ΔRN), is determined and the quantity of stock at the end of the week of frozen productivity ($GSU_{projected_i}$), also considering the dispatch plan for the SC not managed by *Replenishment* ($DIP_{SCorder}$). This calculation is repeated for the second week of frozen productivity and for the first not frozen week, which foresees an assembly plan that will satisfy the forecasted Replenishment Need: for this week then DISP=RN=DIP and consequently $\Delta RN=0$. If for a determinate code the $GSU_{projected_{i}} > 0$ it means that the assigned availability is greater than the demand and so it can re-assigned within the frozen productivity to those SC whose code has a $\Delta RN>0$ (delayed consignment), thus increasing assigned availability for that period and consequently the DIP.

Let us now see how, in the Porcia plant, the temporal organisation of those phases of *Replenishment* that lead to planning restocking and productive lines in short time are organised. As the model stipulates, every day the sales companies send the factory, by EFS95, data regarding sales, the GSC, Arrival Advice and the order portfolio, and on Monday mornings the sales forecasting for the 16 rolling weeks. On Mondays (Figure 7) the TAS and the Replenishment Need is calculated for the 12 rolling weeks. These data are integrated by the level 4 local system with those relative to the factory stocks and transferred to the level 3 system that plans the production lines at weekly intervals. In particular the Dispatch Plan for the current week (W1), the following two weeks (W2, W3) and the expected assembly in two weeks time (W3) are determined.

If necessary on the Tuesday the Dispatch Plan is modified manually and consequently the assembly plan for W3, while on Wednesdays a provisional one is created for week W4, to be used by the suppliers.

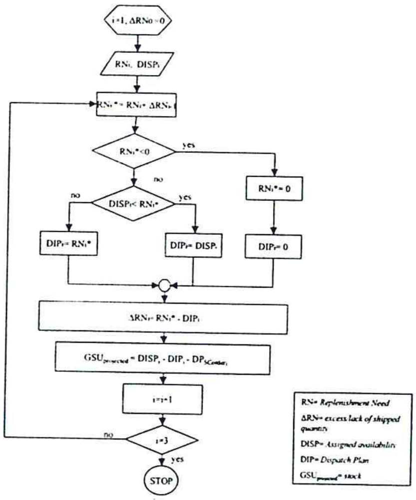


Figure 6. Dispatch Planning

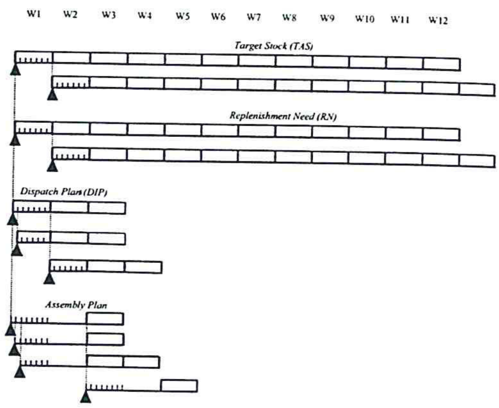


Figure 7. Phases of Replenishment planning

Contexts applicable to *Replenishment*

The field where the process based on the logic of Continuous Replenishment can be applied is not unlimited. Indeed in the Electrolux group factory it is the main but not the only system used to manage supplies for both the upstream and the downstream processes. The greater part of the sales companies is managed by *Replenishment*, but not all. The traditional replenishment system based on orders is still used for the non European customers and the outside contractors. This is mainly due to: 1) lengthy consignment times that thwart all the advantages, in terms of time, gained by the implementation of Continuous Replenishment; 2) scarce penetration of the market with a consequent reduced volume of sales; 3) specific requirements and problematics of the sales company.

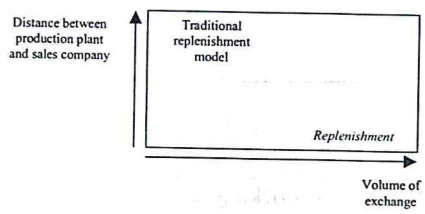


Figure 8. Variables critical in the choice of downstream replenishment systems

Crucial variables that restrict the use of the *Replenishment* process include the distance between the factory and the SC and the volume of exchange. Figure 8 shows the two limiting conditions: *Replenishment* is preferred when there is a high volume of exchange/ modest distance between the factory and the sales company, but when there is a low volume of exchange/ great distance the traditional model of supplies is preferred.

As far as the management of the upstream supplies process is concerned, due to the variety of codes and the suppliers managed the *Replenishment* process, though it is the most used solution does not cover the whole spectrum of the orders issued. Side by side with the *Replenishment* process, justified by the trade volume and importance of the components, not to mention proximity, reliability, and computerisation of the suppliers three other techniques also co-exist:

- traditional management through Reorder Point (ROP). This is used mostly for codes with a low criticality and specificity, small bulk (nuts and bolts, screws, etc.) a moderate trade volume and not requiring great reliability, proximity and computerisation of the suppliers;
- management through the calculation of the requirements with orders = requirements (lot for lot) and without protective systems (safety stock and null safety lead times) so the exact quantity of materials is requested at the moment when production of a determinate lot has begun. The choice of codes managed by this technique (wiring, etc.) is decided by make or buy analysis, as well as the needs and warehouse constraints; they are principally characterised by high specificity and low trade volume. Thus the suppliers must be highly reliable and possess a reasonable degree of computerisation;
- Just In Time management with several consignments a day (JIT by time band). This technique is limited to components with a high trade volume and considerable bulk and so it is better to receive several consignments a day and avoid storage. This type of management requires a highly reliable supplier who is nearby and possesses a certain amount of computerisation. The great bulk and low criticality of the code favour this technique in respect to Replenishment.

The main elements that condition the suitability of *Replenishment* and influence the choice of process to be used are the trade volume, that is, the number of pieces required annually, the bulk of the code, its criticality, i.e. its impact on the availability of the product (cannot be substituted, etc.), the specificity of the code, the proximity of the supplier, and the reliability and the degree of Information Technology of the supplier. The latter two variables, in reality, are strongly linked since, depending on the degree of criticality of the component, supplier selection is strongly influenced by their level of reliability and computerisation.

The values assumed by these variables, shown in Table 1, determine the supplier management systems used by the plant. In reality, often the values assumed by these variables do nor clearly individuate one of the above mentioned conditions. When this occurs the choice of technique is left to the person in charge of buying who then must analyse and evaluate, case by case, the correct weights to be attributed to the variables.

technique / variable	ROP	CALCULATION OF REQUIREMENTS with Orders=Requirements and SS=LTS=0	JIT BY TIME BAND	REPLENISHMENT
volume	medium	medium	high	high
bulk of the code	low	medium	high	medium
Criticality of the code	low	medium	low	high
specificity of the code	low	high	low	low
proximity of the supplier	low	medium	high	high
reliability of the supplier	low	high	high	high
Level of IT of the supplier	low	medium	high	high

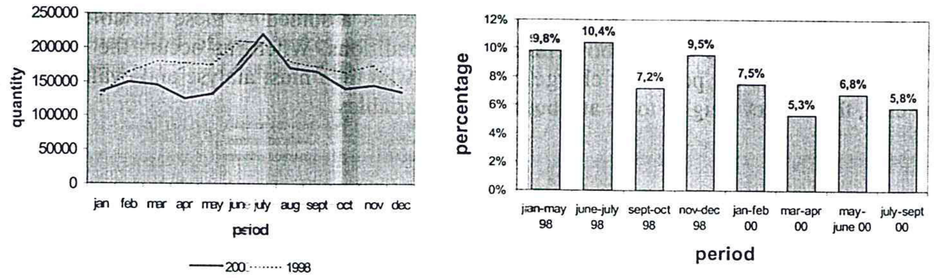
Table 1. Contexts applicable to the management systems of upstream supplies

Results and Discussion

The adoption of the *Replenishment* process has proved a great success for the Electrolux group. The change from the logic of traditional restocking to the *Replenishment* approach has provided significant advantages for all involved in the distribution and supply chain. In particular for the factory these include: a) immediate response to the customer's various requirements, b) higher level of customer service, c) fewer errors thanks to the elimination of paper work, d) increased market visibility, e) improved planning and reduced re-planning, f) significant reduction in the stock both inside the factory and in the upstream and downstream assembly chain, g) better management of risks and opportunities, h) greater sales.

Examining the Electrolux plant in Porcia, and comparing the years 1998 (the year when the CR process directed towards the SC was installed) and 2000 (the year in which the process can be considered a regime), the results achieved can be calculated by analysing the main performance indicators of the supply chain: the integrated inventory and analysis of the Order Fill Rate.

As can be seen from Figure 9.a) the volume of integrated supplies has been notably reduced (in certain periods it has reached 30%), with a consequent significant decrease in the cost of storage to the advantage of the whole chain. This reduction in costs can be transformed into a reduction in the price of the product leading possibly to an increase in sales.



(a) (b)

Figure 9 (a) State of the integrated supply; (b) Percent of order lines not filled due to the productive system

Another important result is that obtained from the analysis of the Order Fill Rate, that is the firm's ability to satisfy in terms of time and volume, the requirements of the end customer, estimating the orders not correctly filled. In particular the number of orders not settled by the firm on the agreed date or in the agreed quantity due to a lack of stocks, and so directly due to the productive system, are evaluated.

Passing from 1998 to 2000 (Figure 9.b) it can be seen from the analysis of the Order Fill Rate that there has been an increase in the number of correct shipments and a decrease in the number of orders not correctly fulfilled due to errors imputable to the productive system.

Thus the data show how the implementation of the *Replenishment* model that follows the innovative logic of Continuous Replenishment proposed by the ECR, has enabled the Electrolux group to obtain important results, confirming the realizability of the benefits proposed theoretically. In general the group's appointed goals were reached, and Electrolux's future plans are even more ambitious being linked to an improvement of the supplies process by strengthening communications with suppliers and the sales companies so the state of dispatches and the market trend can be monitored daily. The main objective is to reduce the greatest source of errors and inefficiency in the process, in other words, uncertainties linked to sales forecasts, variables that strongly influence the settlement of the TAS and so the stock level.

In addition the empirical evidence shows that Continuous Replenishment logic, created for the grocery sector, can, with success be extended to other sectors, including that of household electrical appliances. One thing is certain, the importance of the group considered together with its upstream and downstream partners who all use the process of *Replenishment* confirms the inherent value that renders it suitable for implementation. The high sales volume, the criticality of supply and product shipments, the short distance between firm and sales company, the high level of know-how and the state of advance of computer technology are, in fact, decidedly favourable conditions for the adoption of a management technique such as Continuous Replenishment.

Legend

CR (Continuous Replenishment), DIP (Dispatch Plan), ECR (Efficient Consumer Response), EDI (Electronic Data Interchange), EFS (Electrolux Forecasting and Supply System), GIT (Goods in Transit), GR (Goods Retailer), GSC (Goods Sales Company), GSU (Goods Supply Unit), MPC/PO (Model Plan Code/Product Order), OTD (Order TO Delivery), OTP (Order To Payment), PRC (Preconsuntivo), RN (Replenishment Need), SC (Sales Company), SU (Supply Unit), TAS (Target Stock).

References

Axsäter S., "A Note on Stock Replenishment and Shipment Scheduling for Vendor Managed Inventory Systems", *Management Science*, vol. 47, No. 9, 2001.

Cardinali M.G., "I rapporti industria e distribuzione nel settore degli elettrodomestici", *Trade Marketing*, vol. 20, 1999.

Carpaneto G., "Elettrodomestici bianchi verso nuovi circuiti", *Largo consumo*, vol. 11, 1999.

Cetinkaya S., Lee C.Y:, "Stock Replenishment and Shipment Scheduling for Vendor Managed Inventory Systems", *Management Science*, vol. 46, No. 2, 2000.

De Leeuw S., Van Goor Ad R., Van Amstel R.P., "The Selection of Distribution Control Techniques", *The International Journal of Logistics Management*, vol. 10, No. 1, 1999.

De Toni A., Zamolo E. (2002), "Continuous Replenishment: vantaggi, limiti e contesti di applicazione", *Logistica Management*.

Electrolux Zanussi, 1999, *Documentazione interna*, stabilimento di Porcia (PN).

Fry M.J., Kapuscinski R., Olsen T.L. (2001), "Coordinating Production and Delivery Under a (z,Z)-Type Vendor Managed Inventory Contract", *Manufacturing & Service Operations Management*, vol. 3, No. 2.

Ganeshan R., Boone T., Stenger A.J. (2001), "The impact of inventory and flow planning parameters on supply chain performance: An exploratory study", *Production Economics*, vol. 71.

Lo W.Y., Tsai C.H., Li R.K. (2002), "Exact solution of inventory replenishment policy for a linear trend in demand-two equation model", *Production Economics*, vol. 76.

Roland Berger & Partner (1996), *Efficient Replenishment & EDI*, ECR Europe.

Schiavoni F. (1988), "I problemi di gestione del canale in presenza di una distribuzione moderna", *Efficienza e Potere nei canali di distribuzione*, Edizioni Bocconi Comunicazione, Milano.

Spranzi A. (1994), "I nuovi rapporti industria-distribuzione nel mercato dei beni di largo consumo", *Economia e diritto del terziario*, No. 1.

Kurnia Sherah, Swatman Paula M.C., Shouder Don (1998), *Efficient Consumer Response: a preliminary comparison of U.S. and European experiences*, Abstract of Xith International Conference on Electronic Commerce, Bled, Slovenia, June 8-10.

Towill D.R. (1997), "Principles of good practice in material flow", *Production Planning&Control*, vol. 8, No. 7.

Zaninotto E. (1988), "La struttura dei rapporti di canale: il caso dei prodotti non alimentari", *Efficienza e potere nei canali di distribuzione*, Edizioni Bocconi Conunicazione, Milano.