BUDGETING METHODS OF SUPPLIES

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Abstract

This article is a presentation of a modality for budgeting the supplies, making a comparison between two methods: keeping the fixed quantity for being ordered, modifying the period between two commands (called command point system) and maintaining constant intervals between commands with a change of the ordered quantities (system called periodic replenishment). The theoretical description of the working methodology is followed by a case study conducted in a business in which we applied the Wilson model. There are also highlighted the limitations as well as the strengths of the two methods under study.

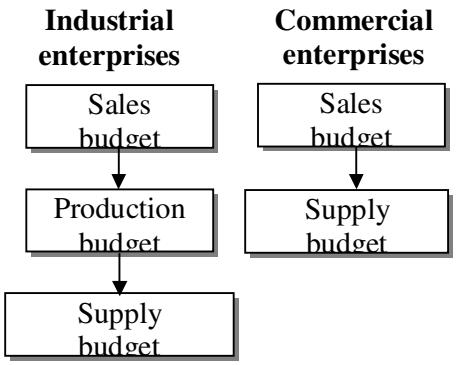
Keywords*: budget, supply, Wilson model, orders, deliveries*

JEL classification*: L23, M21*

1. Introduction

The supply budget aims to ensure optimal management of stocks of raw materials, consumable materials, products, goods, etc. to avoid stock ruptures and overstocks as well as minimizing the cost of supplies. It is closely related to the budget production in industrial enterprises and directly related to the sales budget in the commercial companies.

Fig. 1. The link of the supply budget to other budgets



Regardless of the activity in budgeting the supplies we must take into account the storage policy of the company.

2. The stages for drafting the supply budget

Building the supply budget involves the completion of these steps (Gervais, 1994, pp. 92-95):

A. The determination of the method of supply;

B. Determining the budget process;

C. The drafting of the corresponding sub-budgets;

D. The valuing of the quantities.

A. Methods of Supply

The Wilson model can be successfully applied in the conditions of a constant consumption .A constant consumption determines constant supply periods and supplied quantities. The reality is this harmony does not exist as the consumption varies. The company will have to determine how to carry supplies. There are two classic ways possible:

1. Maintaining the fixed quantity for being ordered, modifying the period between two commands (called command point system);

2. Maintaining constant intervals between commands with a change of the ordered quantities (system called periodic replenishment).

B. Budgetary Procedures

Two budgeting methods can be used for budgeting the supplies:

- *The accounting procedure*. Budgeting the supplies using the accounting procedure is performed through a table in which the main information are: initial stock, supplies (inputs), consumption, theoretical final stock (the stock with split) real final stock (corrected stock), quantity ordered and delivered, the date of making the order, order arrival date (delivery date).

- *The graphic procedure*. In this procedure the supply budgeting is realized in a system of coordinate axes where the x axis represents the time and the y axis represents the cumulative consumption and the successive deliveries added to the initial stock (cumulative inputs).

For the case study presented below, I chose to use the accounting process.

C. Sub-budgets elaboration

The supply budget is divided into several sub-budgets, which can be expressed both quantitatively and in value:

- The budget of orders;

- The budget of deliveries;

- The budget of consumption;
- The budget of stocks.

D. The valuing of budgets

Theoretically the valuing of the four budgets can be done at different prices and that is because the price of a command is not always the same with the delivery price and different methods can be used for the evaluation of the outputs from the stock. If you want to still keep a simple concordance between documents, a valuing of the budgets is recommended with a single price, usually a standard price (Gervais, 1994, p. 95).

3. The constant replenishment system (budgeting by constants lots)

According to this system (also called the control point system) the amount of replenished Q remains constant, and the time interval between two orders will vary so that the demand is met. The regular fixed amount for being ordered and the level of the stock alert should be specified in the header of the sheet stock of the item. The quantity for being ordered is determined in such a way to minimize the cost of supply and storage (calculation is done using Wilson model).

A fixed amount is ordered when the stock reaches a critical value equal to:

Replenishment stock = (Dc x t) + Ss

in which:

Dc - daily consumption;
t - the average time for obtaining an order expressed in days;
Ss - safety stock.

The deadline for obtaining an order includes the processing time of the order, delivery time from suppliers and handling and control time during the reception. The alert stock is recalculated each period based on recent consumption using the computerization.

The safety stock may be relatively small, it should not cover but the risks that may occur during the period of getting the order (the delivery deadline), i.e. the period between the launch date and the order receipt from the supplier. Computerization allows real-time updating of inventory by recording the inflows and outflows from stock too and so the purchase orders can be edited automatically.

4. The fixed periodicity system (maximum stock replenishment)

According to this method the time interval between two successive orders is fixed, the supplied quantities are those that vary. This time period and the number of orders during the year are calculated according to Wilson model and the objective is minimizing the cost of supply and storage.

The fixed replenishment period will be indicated on the stock sheet of the stocked item as well as replenishment level (quantity sufficient to cover the needs for a period equal to the supply level (the interval between orders) plus time for obtaining the order (with delivery time). The replenishment level L_r is determined using the formula:

$L_r = [Dc \times (T + t) + Ss$

in which:

Dc - daily consumption;

T - time of supply;

t - average time for obtaining an order;

Ss - safety stock

Quantity to be ordered Q_r is equal to the replenishment quantity reduced with the available quantity in stock on the day of order.

5. Case study on budgeting the supplies

We know the following information related to a raw material:

- The supply term: 30 days;
- Safety stock: 10 days of future consumption;
- Annual purchases: 2.000 kg., with the price of 5 lei/kg. ;
- Cost of storage: 0,5 lei per kg per month;
- Cost to launch a command: 375 lei;
- The provided consumption of raw materials is in Table 1.

Table 1. Consumption provided

Month	Consumption (kg)
January	200
February	180
March	170
April	150
May	150
June	130
July	130
August	120
September	130
October	200
November	220
December	220

Source: Information provided by the company

Based on Wilson model the following can be calculated:

- Economic quantity for being supplied (Q_e):

$$Q_e = \sqrt{\frac{2 \cdot C_l \cdot Q}{c_d}}$$

in which:

C_l - the cost of launching the command;

Q – the quantity to be purchased;

c_d - unit storage cost per year.

$$Q_e = \sqrt{\frac{2 \cdot 375 \cdot 2.000}{0{,}5 \cdot 12}} = 500\,\text{kg.}$$ (Variable data)

- Optimal cadence for supply:

$$N_o = \sqrt{\frac{Q \cdot c_d}{2 \cdot C_l}} = \sqrt{\frac{2.000 \cdot 0{,}5 \cdot 12}{2 \cdot 375}} = 4$$

- Optimal interval between two commands:

T_o = 12 months/4=3month (for varying amounts)

5.1. Budgeting by constant batches

In this form of budgeting the size of an order will be of 500 kg. The company will have to determine the date on which delivery is to take place and date to launch the command (Table 2).

The amount of 500 kg is ordered when the stock is at the level of the stock replenishment. Expressed in days, this stock is:

The replenishment stock in days = Delivery time + safety stock in days = 30 days + 10 days = 40 days.

► It is observed that the risk of rupture of the stock appears in March for the first time. The average daily consumption this month is 5,484 kg/day (170 kg/31 days). The initial stock of 120 kg is enough for 22 days (120 kg/5,484 kg/day) not for 40 days as the size of the stock replenishment is, with the result that the order must be made 40 days prior to March 22, i.e. Feb. 11 (assuming that February has 28 days). Order delivery date is every 30 days starting from February 11, i.e. on March 13.

► In June the average daily consumption is 4,333 kg/day (130 kg/30 days). The initial stock of 150 kg is covering 35 days (150 kg/4,333 kg/day), that is the whole month of June and five days from July). Because the replenishment stock is for 40 days, the order must be issued 40 days prior to July 5, on May 27. Order is received after 30 days on June 26.

► In October the average daily consumption is 6,4516 kg/day (200 kg/31 days). The initial stock of 140 kg covers the needs of 22 days (140 kg/6,4516) until October 22. As the replenishment stock is of 40 days the command must be issued 40 days prior to October 22, i.e. on September 13. The order arrival time is over 30 days, on October 13.

► In December, the average daily consumption is 7,1 kg / day (220 kg/31 days). The initial stock of 220 kg covers 31 days (220 kg/7,1 kg / day). Because the replenishment stock is 40 days, the order must be issued 40 days before December 31, which is on November 22. The order will be received by December 22.

Table 2. Budgeting in constant batches

Indicators	**I**	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**
Initial stock	500	300	120	450	300	150	520	390	270	140	440	220
Deliveries			500			500				500		500
Consumption	200	180	170	150	150	130	130	120	130	200	220	220
Final theoretical stock*	300	120	-50	300	150	20	390	270	140	-60	220	0
Final real stock **	300	120	450	300	150	520	390	270	140	440	220	500
Orders released												
- Quantity		500			500				500		500	
- Date		11 feb			27 may				13 sep		22 noi	
Incoming orders (deliveries)												
- Quantity			500			500				500		500
- Date			13 mar			26 Jun				13 oct		22 dec

Source: my processing based on the information provided by the enterprise

* - before the deliveries

Final theoretical stock = Si – Consumption

** - after deliveries

Final real stock = Si + Deliveries - Consumption

5.2. Budgeting by constant periods

The period between two successive orders is of 3 months, under this form of budgeting, the supplied quantities are those that will vary (Table 3).

The risk of rupture of the stock occurs in March. As it was calculated for budgeting through constant lots, the average daily consumption in this month is 5,484 kg/day (170 kg/31 days). The initial stock in March of 120 kg is enough for 22 days (120 kg/5,484 kg/day) not for 40 days as it is the size of the replenishment stock. The order will be made 40 days prior to March 22 that is on February 12.

Given the fixed rhythm of three months, the other commands will be made as it follows: Order 2 - on May 12, the order 3 – on August 12, Order 4 – on November 12 (it was considered the average of a month to be of 30 days). The orders will be received one month from their release date.

The quantities to be ordered are calculated taking into account the fact that that they have to cover the consumption of three months following the date of the appearance for the risk of stock rupture.

► In March, as the risk is on 22, the amount ordered on February 12 (received after a month, i.e. March 12) should cover consumption between 22 March and 22 June. The quantity to be ordered is:

- Consumption of March 22 to March 31: 50 kg (170 kg total consumption of the month minus the initial stock of 120 kg from that month);
- April consumption: 150 kg;
- May consumption: 150 kg;
- For the consumption between June 1 and June 22. It is calculated the average daily consumption of June: 130 kg/30 days = 4,33 kg/day. Consumption of 1 to 22 June is: 22 days x 4,33 kg/day = 95 kg.

The total quantity for being ordered on February 11 is 50 kg + 150 kg + 150 kg + 95 kg = 445 kg.

►The quantity for being ordered associated to the command that will be launched on May 12 (and received on June 12) should cover the consumption between 22 June and 22 September and is:

- Consumption of June 22 to June 30: 35 kg (total consumption of 130 kg in June - consumption by 22's of 95 kg);
- July consumption: 130 kg;
- August consumption: 120 kg;
- For the consumption between 1 September to 22 September. The average daily consumption is calculated for September: 130 kg/30 days = 4,33kg/day. The consumption between 1 to 22 September is: 22 days x 4.33 kg/day = 95 kg.

Total quantity for being ordered on May 12: 35 kg + 130 kg + 130 kg + 95 kg = 380 kg.

Table 3. Budgeting by constant periods

Indicators	I	F	M	A	M	J	J	A	S	O	N	D
Initial stock	500	300	120	395	245	95	345	215	95	576	376	156
Deliveries			445			380			611			64+x*
Consumption	200	180	170	150	150	130	130	120	130	200	220	220
Final theoretical stock*	300	120	-50	245	95	-35	215	95	-35	376	156	-64
Final real stock **	300	120	395	245	95	345	215	95	576	376	156	
Orders released - Quantity - Date		445 12 feb			380 12 may			611 12 aug			64+x* 12 nov	
Incoming orders (deliveries) - Quantity - Date			445 12 mar			380 12 jun			12 aug			64+x* 12 dec

* - x is consumption between 1 January N+1 and 22 March N+

Source: my processing based on the information provided by the enterprise

► The quantity to be ordered on August 12 (and is received on September 12) should cover consumption between September 22 and December 22:

- For the consumption of September 22 to September 30: 35 kg (total consumption of 130 kg September - consumption by 22's of 95 kg);
- For the October consumption: 200 kg;
- For the November consumption: 220 kg;
- For the consumption between the first of December and 22 December. The average daily consumption for this month is calculated: 220 kg/31 days = 7,1 kg/day. The consumption between 1 to 22 December is: 22 days x 7,1 kg/day = 156 kg.

Total quantity to be ordered on August 12: 35 kg + 200 kg + 220 kg + 156 kg = 611 kg.

► In November the command that will be launched on the 12th day of the month (and received on December 12) should cover the consumption between December 22 N and March 22 N + 1. Consumption in the period between December 22 N and December 31 N is 64 kg (total consumption of 220 kg in December minus the consumption of the 156 kg until the 22 of the month).

Conclusions

Budgeting by constant lots requires daily monitoring of the level of the various stocks and orders for being released, a reason for which the order management administrative costs are high. It does not allow the grouping of orders, even when items for being stocked come from the same supplier.

By applying the system with fixed periodicity the administrative costs for managing orders are reduced. By ordering at regular intervals, the possibility of regrouping the orders is created. You can also expect a better compliance with delivery times from suppliers through regular supply plan proposal. As a drawback of this system we can mention the fact that the safety stock must meet fluctuating needs throughout the period T between two supplies. This system is less flexible, less reactive, recommending it to be applied only items with very regular rotation.

Whichever method of supply used, the last step is valuing budgets. I recommend valuing of the four sub-budgets (the budget for orders, the budget for deliveries, the budget for consumptions and the budget for stocks) with a single price, usually a standard price, taking into account the probable course of prices during the period under budgeting (Gervais, 1994, p. 95).

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