

# Specifics of formation the portfolio of orders on the basis of break even analysis for Iron and Steel Works

Evgenia Zambrzhitskaia<sup>1,\*</sup>, Tatyana Kozlova<sup>1</sup>, and Anastasia Mamaeva<sup>1</sup>

<sup>1</sup>Nosov Magnitogorsk State Technical University, 455000 Magnitogorsk, Russian Federation

**Abstract.** The issue of orders portfolio formation becomes more and more actual in terms of evolving economy crisis, consequences of which turned into the growing competition both in domestic and foreign markets. Goals of research – formalization of order portfolio formation procedure. The purpose of our academic research – to develop the algorithm for order portfolio formation suitable for iron and steel works. The article suggests the possibility of using break-even analysis indices, in particular, the research introduces a «break-even point» concept in terms of efficient order portfolio. Usage of break-even point indices is more preferable to others (marginal revenue, cost-effectiveness and etc.) the main advantages of the suggested analysis are: 1) great information capacity from the point of management decision making; 2) the suggested analysis is less governed by price factor than marginal revenue.

## 1 Introduction

In terms of intense competition, innovative technology and periodical crisis events, iron and steel companies have to combine flexibility in working process with target customers and supreme economic viability achievement in the industrial activity. The solution of this task is directly connected to the effective methods searching of order portfolio formation.

It is necessary to mention that today there is no common approach in order portfolio formation (in theoretical or practical aspect) [20, 21]. Thus every business entity develops its own method and approach, which corresponds to industry specific standards and promotes the adoption of effective management decisions

### Problem Statement

The task of formation of effective order portfolio usually lies on sales department. [21]. Nowadays the main criteria of order portfolio formation for enterprises of metallurgical complex are:

- Optimal payload for the current production capacities
- Maximization of order effectiveness (generally is achieved by means of benchmarking study applying in the sphere of industry orders).

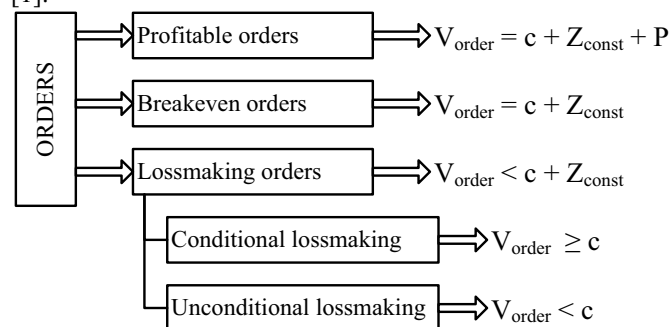
The current framework concentrates on the valuation of price components, because the optimum work load productive capacity has a satisfactory solution and regularly used in practice. [4, 5, 6].

## 2 Main Part

### A. Production order classification

While solving the problem of effective order portfolio forming there is a necessity to figure out the order classification: to determine classification features and main classification elements.

Roughly all the orders, preceded at a factory, can be divided into three groups (from economic point) (fig. 1) [1].



**Fig. 1.** Order classification (for a factory unit).

On the fig. 1 the following indications are taken:  
 $V_{order}$  – order value (company commercial proposal);  
 $c$  – variable costs, according to order (out-of-pocket unit costs);  
 $Z_{const}$  – constant expenses part moved to an order;  
 $P$  – profit (in any industry, including smelting sector, it is possible to figure out current profit rate).

Many metallurgical plants in terms of slump in demand, are ready to orders at cost.

All the orders with formula  $V_{order} < c + Z_{const}$  are traditionally considered to be unprofitable and not useful for any industry. This group can be roughly divided into two categories:

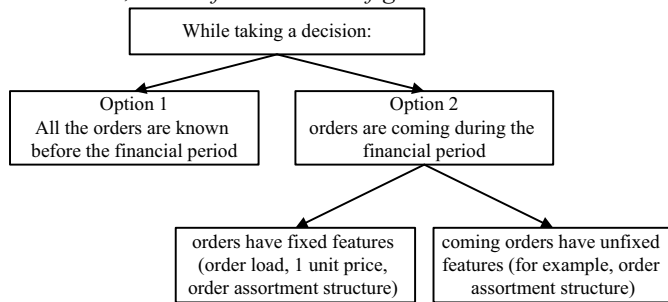
\* Corresponding author: jenia-v@yandex.ru

1 category: conditionally unprofitable – orders, covering all direct and a part of appointed indirect costs.

2 category: unconditionally unprofitable – orders are totally unacceptable for any business and are only taken for the purpose of market gain of for any other strategic reasons (image, technology development and etc.) [1].

B. *Analysis of the main order portfolio formation options*

C. *The following stage is determination of possible order portfolio formation options in terms of iron and steel works, basic of which are in figure 2.*



**Fig.2.** Possible order portfolio formation options in terms of iron and steel works.

The first option is the most preferable for business, because in this case the task of order portfolio formation is quite simple. To achieve this aim special kinds of programs are used. These programs are focused on checking of general order quantities to form references such as «accept – exclude».

As a rule, the general checking criteria are shown in fig 3.

<b>CHECKING CRITERIA</b>	<b>DIMENSIONS</b>
	Dimensions are complex of determined features (size and measures, technical specifications and etc.) There is a possibility to group products according to standard size or the same technological specifications
	<b>TECHNICAL CAPACITY AVAILABILITIES</b>
	If there are worked out technology and corresponding equipment (equipment and technology construction)
	<b>ORDER SCOPE</b>
	Most of companies use a term “economical lot”, which is connected to machine capacity, for example: a customer wants to buy 5 tons of mill production; however the minimal equipment load is 50 tones and there is no a customer to buy the rest 45 tones. Thus, the analyzed order is not acceptable according to the current feature.
	<b>MARGINAL REVENUE</b>
	The current indicator is determined as a price excluding variable costs (established according to competitors’ offers and discussions with customers)

**Fig. 3.** The general checking criteria of order portfolio construction (version 1).

It is important to mention, that some companies use other indicators instead of “marginal revenue”, in particular – efficiency, profit and etc. the most preferable indicator is «break-even-point» (BEP). This factor calculation is recommended to do according to the following formula (in terms of multiproduct industry, like iron and steel works companies) [3, 7, 10, 11, 12]:

$$V_0 = \frac{Z_{const}}{\sum_{i=1}^n (p_i - c_i) \times v_i} \quad (1)$$

where

$V_0$  – overall production account in BEP in physical terms;

$Z_{const}$  – total constant expenses

$p_i$  – price of  $i$ -type product;

$c_i$  – out-of-pocket unit costs of  $i$ -type product.

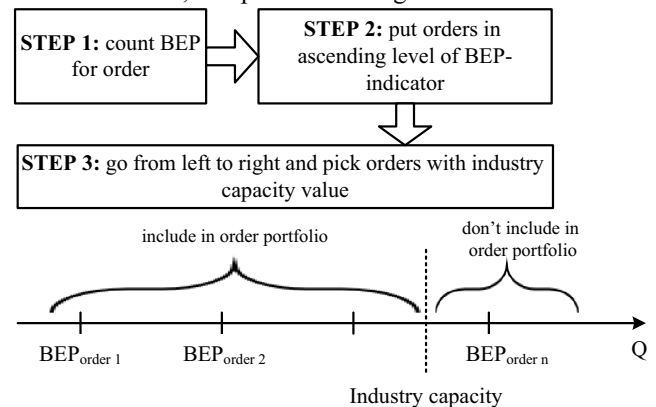
$v_i$  – part of  $i$ -type product, calculated by formula.

$$v_i = \frac{V_i}{\sum_{i=1}^n V_i} \quad (2)$$

Indicator BEP, calculated by formula (1), must be analyzed in view of product range [15]. In fact, a special product measuring unit is used. This unit can be called conditional selection unit. Conditional selection unit – is an assortment (package), including every kind of output in a set lot the sum of all product lots is equal to a unit or 100%.

It is important to mention that while determine BEP one cannot use conventional tons instead of conventional set units, because conventional tons show difficulties in output processing (in iron industry) or other characteristic (for example, cement strength in cement sector), what is not connected to a product range, constant and out-of-pocket unit costs correlation.

The scheme of order portfolio formation for the case, mentioned above, is represented in fig. 4.



**Fig.4.** Offered sequence of order portfolio formation in the first option.

In the second option of order portfolio formation is supposed that manufacturing orders are taken in different time and the decision about the order must be made immediately: accept or refuse.

In terms of the second option there can be 2 situations:

- Incoming orders with fixed characteristics (order size, one unit price, assortment order structure);
- Incoming orders with unfixed («float») characteristic (for example, assortment output);

Let's have a closer look at each option, mentioned above. Case, when income orders have fixed characteristics (order size, one unit price, and assortment order structure) is possible in terms of working with big industry companies, which are able to organize further rolled metal products processing.

\* Corresponding author: jenia-v@yandex.ru

These customers are usually called «key customers/purchaser». As a rule, industries, where this rule is working are:

- Car industry;
- Industries specialized on different sized pipes and tubes production;
- Car production facilities;
- Defense enterprises;
- Hardware production industry.

On average the mentioned customers' category can consume from 50% till 65% of overall iron and steel work production. To work with this customer group demands order portfolio formation using BEP. In this case order must correspond to certain conditions:

1. BEP of order must not be more than BEP critical, which is describes further;
2. Scope of all income orders will be compared to productive capacity.

Business process of making management decisions is shown in fig.5.

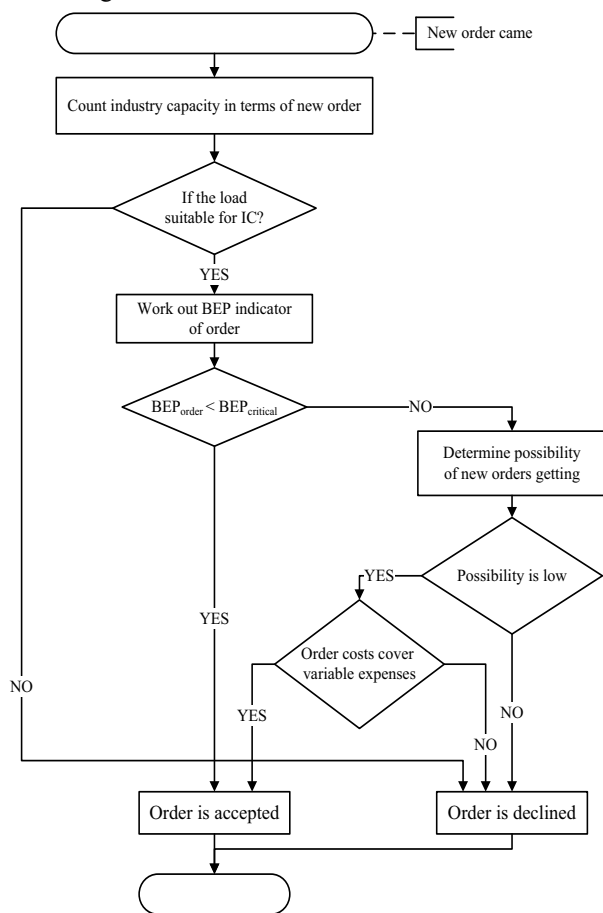


Fig. 5. Business-process flow chart of order portfolio formation.

As one can see in fig.5, when a new order is got, firstly the possibility to add it to the load of current productive capacity (PC). If it is possible, than BEP calculations should be made. Than the mentioned indicator must be compared to some critical meaning by means of calculations. The point of calculations is demonstrated on the example below.

D. Conditional example, explaining the BEP order calculation mechanism

Let's suppose there is a regular order from a car industry company. The order specification is fixed and corresponds to: cold-rolled sheet, cold rolled coil, hot-rolled sheet, hot-rolled band, bar section, hot-rolled round steel bar.

BEP must be worked out for every kind of product i.e. we suppose that the order contains only mentioned products. Worked out BEP scheme for product "A" (cold rolled sheet) is illustrated in fig. 6 [13, 14, 16, 17, 19].

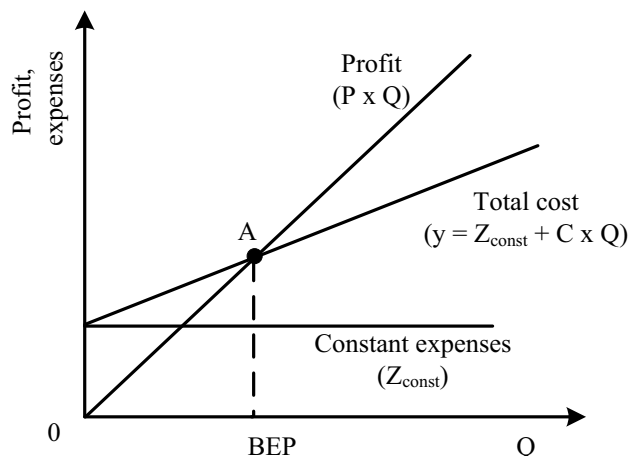


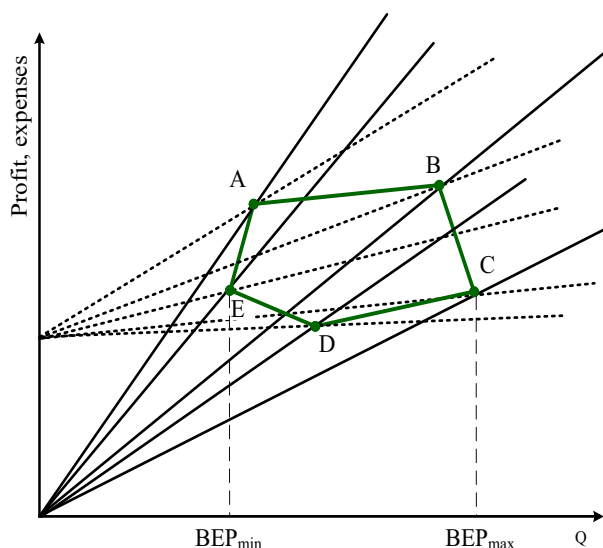
Fig. 6. BEP scheme for product "A" (cold rolled sheet)

While releasing n-type production, the crossing point of profit and expenses has a form of convex, which projection on the strain levels are indicated on the x-coordinate axis gives a possible position oh BEP in terms of selection structure different options. The composition scheme of the hexagon from the example is shown in fig. 7.

Thus, critical BEP meaning is a minimal meaning of the given indicator, i.e.  $BEP_{critical} = BEP_{min}$ .

It is important to mention that today iron and steel works use marginal revenue as main economic criterion instead of suggested BEP indicator. This indicator, as was mentioned above, has disadvantages, main of which are heavy reliance on price and low information value from the point of management accounting.

\* Corresponding author: jenia-v@yandex.ru



**Fig.7.** The composition scheme of the hexagon in terms of n-type production releasing.

If the order does not fit to BEP criterion there should be determined a possibility of next order. Statistical techniques are useful on this stage. If the possibility of the next order is not high (less than 70%), than it should be accepted only in case of absolute variable costs covering. Otherwise, the order is better to decline, because it will be lossmaking and provoke losses within the analyzing industry.

Now let's analyze the situation, when orders have unfixed («float») assortment structure. Such case can happen at industries, which resale iron and steel products. The mentioned customers' category is called «metal tradespeople». Their total make share can be from 40% till 55%. Typical type of work with this customer's category is signing of «blanket agreements, where assortment structure is not fixed and depends on market condition. Expediency consideration of getting into the order portfolio of mentioned agreements must be done according to the following algorithm:

1. Sphere of possible BEP changes in terms of different assortment structures [8, 9], mentioned in the «blanket» agreements for the production delivery must be identified (similar to fig. 7);

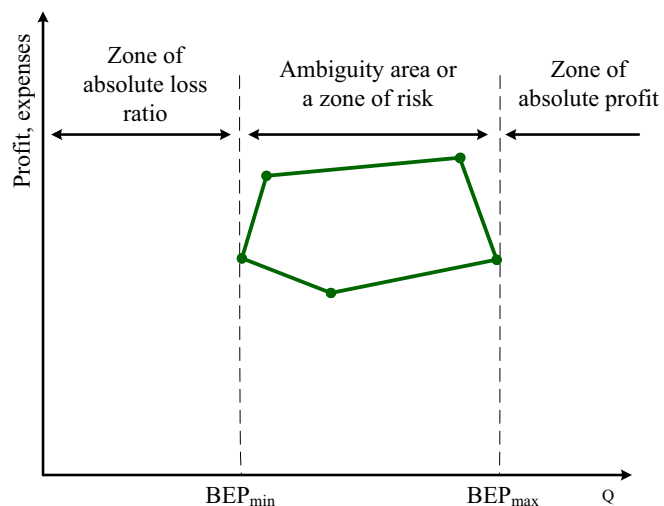
2. The zone of the analyzing order must be determined. The following zones are possible:

a) *Zone of absolute loss ratio* (in this case order is declined);

b) *Zone of absolute profit* (in this case the order is accepted);

c) *Ambiguity area or a zone of risk*, where financial result depends on assortment structure (in this case production range is to be defined).

Graphically the suggested mechanism is shown in fig. 8.



**Fig.8.** Possible zones of industry work according to «profit» criterion.

### 3 Conclusion

It is important to mention that practical usage of the suggested method of order portfolio formation can be released as a business process in enterprise information system (EIS) (for example, ORACLE and etc.). Minimal claim to the EIS software is support of the basic business processes.

In conclusion must be said that the suggested method can improve order portfolio formation procedure efficiency in terms of modern iron and steel works. This method also makes the work effectiveness more valid from the economical point of view, what can help to avoid possible losses, caused by ineffective approach to order portfolio formation.

### References

1. I.S. Berezovski, Economic systems management: electronic scientific magazine, **31** (2011)
2. M.A. Vahrushina, *Accounting management: Student book for universities* (Omega-L; High School., Moscow, 2003)
3. E.S. Voinova, G.V. Danilov, I.G. Rijova, Scientific and technical reports of St-Petersburg State technic University. Economic Science, **3-1(58)**, 225-230 (2008)
4. G.V. Danilov I.G., Rijova, E.S. Voinova, Scientific and technical reports of St-Petersburg State technic University. Economic Science, **4(102)**, 87-90 (2010)
5. G.V. Danilov, I.G. Rijova, E.S. Voinova, Nosov Magnitogorsk State Technic University Messenger, **1**, 79-82 (2012)
6. G.V. Danilov, E.S. Zambrzhitskaia, I.G. Rijova, Analysis of industry capacity smoothness, break-even point and financial safety margin, **43**, 18-23 (2012)

\* Corresponding author: jenia-v@yandex.ru

7. G.V. Danilov, E.S. Voinova, I.G. Rijova, Modeling of assortment influence on main industry indicators, **15**, 40-46 (2012)
8. G.V. Danilov, E.S. Voinova, I.G. Rijova, International accounting management, **21**, 22-28 (2012)
9. G.V. Danilov, I.G. Rijova, E.S. Voinova, Scientific and technical reports of St. Petersburg State technical University. Economic Science, **6-1(90)**, 163-157 (2009)
10. G.V. Danilov, I.G. Rijova, E.S. Voinova, Economic analysis: theory and practice, 26, 35-39 (2009)
11. E.S. Zambrzhitskaia, Joint fund current events Science and education, **11(78)**, 95 (2015)
12. R. Zeman, M. Vohoxka, E.S. Zambrzhitskaia, N.I. Ivanova, R. Pihova, M. Popilkova, K. Kabourkova, *Management accounting: teaching guide* (Nosov Magnitogorsk State Technical University, 2015)
13. O.N. Volkova, *Accounting management* (Moscow, TK Welby, 2010)
14. Collin Drury, *Management and cost accounting. Introductory course: Educational complex for university students* (Unity-DANA, Moscow, 2012)
15. V.B. Ivashkevich, *Management accounting: teaching guide* (Master, Infra-M, Moscow, 2013)
16. T.P. Karpova, *Accounting Management: student book for universities* (Unity, Moscow, 2002)
17. N.P. Kondrakova, M.A. Ivanova, *Management accounting: teaching guide* (Infra-M, Moscow, 2013)
18. I.G. Kukunina, *Accounting Management. Losses management Management analysis*
19. Ch. Horngern, G. Fosters, Sh. Datar, *Management accounting* (Piter, St. Petersburg, 2008)
20. I.B. Chachina, C.V. Gorodnichev, Tul'skiy State University news. Economic and legal science, **1-1**, 199-203 (2013)
21. N.I. Trishkina, *Science XXI century. Proceedings of materials the international scientific conference*, 321-328 (2015)

---

\* Corresponding author: jenia-v@yandex.ru