

## OPTIMIRANJE ASORTIMANA NJEGOVI SUŽAVANJEM U REHABILITACIJI ŽELJEZARA

## OPTIMISATION OF PRODUCT-MIX BY ITS SHRINKAGE IN REHABILITATION OF THE IRON&STEEL WORKS

**Prof. Dr. Sc. Faik Uzunović**  
Fakultet za metalurgiju i materijale  
Univerzitet u Zenici, 72 000 Zenica  
Bosna i Hercegovina

**M.Sc. Aida Franjić**  
Ekonomski fakultet  
Univerzitet u Zenici, 72000 Zenica

**M. Sc. Šaban Žuna**  
Fakultet za metalurgiju i materijale  
Univerzitet u Zenici, 72 000 Zenica  
Bosna i Hercegovina

### REZIME

*Kao posljedica rata 1992.-1995. u Bosni i Hercegovini, od 1992.-2007. željezara u Zenici je bila zatvorena u smislu integralne proizvodnje, ali su dvije male elektro peći, par SM peći i novoizgrađena 100t elektro peć (ta je bila izgrađena nakon rata) davale malu, ali značajnu i neprofitnu proizvodnju. Ta željezara je poslije rata prošla faze privatizacije kao BH Steel, LNm, Mittal Steel i ArcelorMittal, a sada je privatizovana s 91% vlasništva ArceloMittal-a. Ovaj rad ima za cilj da predstavi varijantu optimiranja asortimana proizvoda integralne željezare njegovim sužavanjem u različitim vremenskim i ekonomskim periodima rehabilitacije njenih proizvodnih pogona.*

**Ključne riječi:** Optimiranje, sužavanje, asortiman proizvoda, rehabilitacija, željezara

### ABSTRACT

*As a consequence of the war in Bosnia and Herzegovina 1992-1995 it happened that from 1992 till 2007, Iron and Steel Works in Zenica was closed as the integrated iron and steel works, but two small Electric Arc Furnaces(EAF), a few remaining Open Heart Furnaces and newly built 100t EAF (that one was built after the war), were giving all that time a small scale, but important, non-profit production. After the war that Iron and Steel Works has been passing several privatization stages as BH Steel, LNm, Mittal Steel and ArcelorMittal, and it is now privatized as 91% owned by ArcelorMittal. This paper is an attempt to present the variant about an optimisation of product-mix through its shrinkage in different time periods regarding economy frame-work, and plant rehabilitation process.*

**Keywords:** Optimization, shrinkage, product-mix, rehabilitation, Iron and Steel Works

## 1. INTRODUCTION

Due to war in Bosnia and Herzegovina 1992-1995 from 1992 till 2007, Iron and Steel Works in Zenica was closed as the integrated iron and steel works, but two small Electric Arc Furnaces(EAF), a few remaining Open Heart Furnaces and newly built 100t EAF (that one was built after the war), were giving all that time a small scale, but important, non-profit production. That Iron and Steel Works has been passing several privatization stages as BH Steel, LNm, Mittal Steel and ArcelorMittal. It is now privatized and 91% owned by ArcelorMittal.

In a post-war period, from 1998 its ownership and name has had been changed several times, as mentioned above. Till 2001 all first-stage non-efficient facilities were eliminated, as well as major surplus employment. In the end of 2002 new 100t capacity Electric Arc Furnace (EAF), with Continuous Casting CC Machine started to be built. Start-up of these specified facilities took place in the last quarter of 2004. In 2008 the a. m. facilities were closed, due to the optimization of steel product-mix by its shrinkage. At that time majority shareholder Mittal Steel has started to use only the integrated Iron and Steel Works and continue to produce. That situation is still on with ArcelorMittal including some changes in further shrinkage of the product-mix for the period 2012-2015. These and some other performances of now concept of ArcelorMittal iron and steel works in Zenica are presented in this paper.

## 2. ARCELORMITTAL-ZENICA PRODUCT-MIX POSITION AND FUTURE

In Table 1. is presented simple SWOT analysis to describe the position and orientation of ArcelorMittal – Zenica in its rehabilitation process.

*Table 1. SWOT Analysis of ArcelorMittal – Zenica*

| STRENGTHS  | WEAKNESSES  | OPPORTUNITIES  | THREATS  |
|--|---|--|--|
| More than 100 years of tradition and experience in making, shaping and treating of the iron and steel products | Lack of proper interaction in modern consulting of prevailing owner and domestic recourses                                | Solid market demand in the country, region and in the world  | OHR and many assisting international organizations are scheduled to reduce their mission in BH           |
| Adequate core engineering and specialized staff  | Weak financial position and resources for environmental investment  | Future construction of motorways and improvement of the railways network in the country and the region | Short period and strong pressure to invest in environmental protection                                   |
| Skilled labor force  | Weak domestic human resource management   | Rehabilitation of metal sector in the country and the region   | Political instability in the country and the region  |
| Experience in variety of hot rolled and forged products *  | No more heavy and medium sections, especially rails and railways accessories, as well as the forgings in the product-mix* | No serious competition in the country and the region   | Political/economical interdependence of the countries in the region and their dependence on EU countries |
| Variety of facilities and technologies   | Need to update the knowledge of managers and specialists  | Proper consulting could improve future prospect significantly  | Losing of special and beneficial status in export to USA and EU  |

\*Blooming, Heavy, Medium and old Light Section (as well as old Wire Rod) rolling mills were dismantled and Forging Shop is closed.

Data presented in Table 2. are an attempt to give the estimation of the company position and its future, analysing three different time-variants, including a view to the optimisation of a steel product-mix rehabilitation process by its shrinkage, according to closing of some facilities. The a.m. data are useful to get a better insight regarding previous and future position of that iron and steel works, now belonging to ArcelorMittal, and for the comparison of three different time variants in the performances including steel product-mix shrinkage.

*Table 2. Comparison of steel product-mix and the other selected performances of the Iron and Steel Works in Zenica, now ArcelorMittal-Zenica in three different variants-time (\*)*

| No | Performance  | Year                                |  |   |
|----|--|-------------------------------------|--|---|
|    |  | 1998 (3,4)                          | 2005   | 2012  |
| 1  | Type of Iron & Steel Works (steel production)            | (2 LD Converters+ 2 OHF+2small EAF) | 100t EAF +2LD Converters                     | 100t EAF** +2LD Converters  |
| 2  | Installed Capacity (t/y)                                 | 1,6 million                         | 2,2 million                                  | 1,6 million   |
| 3  | Output-Production (t/y)                                  | 0,25 million                        | 0,29 million                                 | 0,72 million<br>Wire rod Ø 5,5-12mm<br>Re/Bars Ø 8-32mm<br>Welded nets<br>Forged products |
| 4  | Utilization of Existing Capacities (%)                   | 15                                  | 14   | 40  |
| 5  | Utilization of Efficient Facilities (%)                  | 15                                  | 14   | 50  |
| 6  | Utilization of Inefficient Facilities (%)                | 15                                  | No Inefficient Facilities                    | No Inefficient Facilities   |
| 7  | Total Sales (\$US/y)                                     | 220 million                         | 260 million                                  | 310 million   |
| 8  | Profit (-Loss) (\$US/y)                                  | - 5 million                         | 5 million                                    | 10 million  |
| 9  | Total Exports (\$US/y)                                   | 17 million                          | 45 million                                   | 73 million  |
| 10 | Total Number of Employees                                | 12 500                              | 5 200  | 3 500   |
| 11 | Total Number of Effective Employees                      | 5 200                               | 5 200  | 350   |
| 12 | Total Number of Laid off Employees                       | 7500                                | no   | no  |
| 13 | Total Number of Indirect Employees                       | 10 000                              | 10 000                                       | 10 000  |
| 14 | Total Number of Effective Indirect Employees             | 2 000                               | 2 000  | 2 000   |
| 15 | Total Number of Laid off Indirect Employees              | 8 000                               | 8 000  | 8 000   |
| 16 | Company Book Value (\$US)                                | 370 million                         | 450 million                                  | 490 million   |
| 17 | Market Value (\$US)                                      | 250 million                         | 350 million                                  | 470 million   |
| 18 | Capital/Loan Needed for optimization(\$US)               | 100 million                         | 120 million                                  | 120 million   |
| 19 | Invested (\$US)  | No                                  | 85 million                                   | 40 million  |
| 20 | Ownership  | State Ownership (BH)                | Mixed Ownership (LNM 51%, KIA 40% and BH 9%) | Mixed Ownership (ArcelorMittal 91% and BH 9%)   |
| 21 | Economic Effect  | Bad                                 | Good   | Good  |
| 22 | Political Effect   | Low                                 | Very good                                    | Very good   |
| 23 | Peace Stabilizing Effect and Regional Development Effect | Low                                 | Great  | Very good   |

- \* Author' s estimation on basis: ŽZ-Studija o pokretanju proizvodnje...1995, RMK Inženjering-British Steel Variants for ŽZ...1990, USAID BDP-Sarajevo-Survey of selected sectors...1998 and Data from Chamber of Commerce and industries ZEDOK
- \*\* EAF 100t was closed 2008 and EAF 15t was closed 2009

### 3. OPTIMISATION OF PRODUCT-MIX BY ITS SHRINKAGE IN REHABILITATION OF THE IRON&STEEL WORKS

Yearly production output of the Iron and Steel Works ZENICA (BH Steel, LNm, Mittal Steel, ArcelorMittal) 2005 – 2014 is presented in table 3.

Table 3. Production output of the Iron and Steel Works ZENICA (BH Steel, LNm, Mittal Steel, ArcelorMittal) 2005 – 2014 (\*\*\*)

| FACILITY               | Production [t] |        |        |        |        |        |        |         |         |         |
|------------------------|----------------|--------|--------|--------|--------|--------|--------|---------|---------|---------|
|                        | 2005.          | 2006.  | 2007.  | 2008.  | 2009.  | 2010.  | 2011.  | 2012.   | 2013.   | 2014.   |
| Coke Oven              |                |        |        | 240093 | 255524 | 372825 | 436731 | 451861  | 463823  | 404216  |
| Sinter Plant           |                |        |        | 347681 | 668165 | 849755 | 949265 | 1088979 | 1120777 | 1344079 |
| Blast Furnice          |                |        |        | 242654 | 482469 | 602892 | 684734 | 749539  | 759100  | 860430  |
| BOF Steel Plant        |                |        |        | 228253 | 517282 | 608976 | 669320 | 722041  | 743221  | 815355  |
| EL Steel Plant 100 t   | 269153         | 465171 | 510233 | 207679 |        |        |        |         |         |         |
| EL Steel Plant 15 t    | 20211          | 24864  | 23057  | 12977  | 2090   |        |        |         |         |         |
| Hot (molten) steel [t] | 289364         | 490034 | 533290 | 448909 | 519372 | 608976 | 669320 | 722041  | 744237  | 815355  |
| CC Billets [t]         | 252146         | 444254 | 490793 | 421315 | 492655 | 575186 | 632445 | 685325  | 720900  | 790894  |
| Wire Rod Mill          | 179478         | 260502 | 277808 | 232891 | 267444 | 263666 | 321460 | 331129  | 333301  | 336688  |
| Light Section Mill     | 186148         | 263673 | 270568 | 151234 | 167212 | 210816 | 231117 | 233751  | 258570  | 268142  |
| Single Pass Mill       | 4235           | 4803   | 1451   |        |        |        |        |         |         |         |
| Cold Drawing Plant     | 66794          | 77001  | 90726  | 48546  | 43057  | 38097  | 28282  | 20612   | 13417   | 19867   |
| Forging Shop           | 11034          | 13648  | 14836  | 8438   | 4781   | 9940   | 9542   | 8889    | 634     | 0       |
| Export of CC Billets   |                |        |        |        | 43400  | 93760  | 79468  | 109991  | 119555  | 179611  |
| Export of the Iron     |                |        |        |        |        | 24946  | 37741  | 55911   | 44987   | 65331   |
| Export of Sinter       |                |        |        |        |        | 10142  |        |         |         |         |

\*\*\* Data from Chamber of Commerce and industries ZEDOK

A number of conclusion can be specified out of the data from table 3.

- Integrated iron and steel production started 2008 as well as EL 100t was closed
- Forging Shop was closed in 2013
- From 2008-2014 there is a constant increase in production output of hot (molten) steel
- From 2008-2014 there is a constant increase in product-mix shrinkage

A lot of limitations, difficulties and shortcomings has been taking place in the rehabilitation process of the Iron and Steel Works ZENICA until ArcelorMittal took over and some of them still exist. The main among them were/are the following ones:

- New facilities have to be incorporated according to the existing facilities layout
- Some of the existing facilities have to be modernised
- Forging Shop is closed
- High taxation policy in Bosnia and Herzegovina
- World economy crisis 2009-2010 caused low demand and since that time CC billets, sinter and iron have been exported
- Complicated and slow corporate governance in B&H
- Investment of about 115 million \$ US is still needed for the environmental protection, to meet EU environmental requirements and secure healthy environment for the population of Zenica and its region.

Final layout is now consisted of the following facilities: coke oven battery, sinter plant, blast furnace 2000 cub. m, radial type CCM for billets and 2 remaining (competitive) rolling mills, comprising full modernization and computerization of the Continuous Light Section Mill 250mm among them.

ArcelorMittal - Zenica is to be the leading producer of long products in Bosnia and Herzegovina as well as in the region of former SFR Yugoslavia, even in the world, especially in long products. Accordingly, about 115 million \$ US should be invested in the environmental protection to meet EU environmental requirements.

Quality and yield of the hot rolled wire rod and re-bars is to be increased to satisfy the requirements for an easy-optimal cold drawing in welded meshes factory and in metal sector industry of the region, as well as to increase the profit of ArcelorMittal - Zenica.

It is expected to simplify internal documentation and marking of steel grades, due to requirement to export hot rolled products according to EU and USA standards.

#### **4. CONCLUSIONS**

- Under many limitations, difficulties and shortcomings an optimisation of product-mix is in process to be done by its shrinkage, in process of rehabilitation of an integrated iron and steel works, like The Iron and Steel Works - Zenica was, and still partly is, although it is now ArcelorMittal – Zenica iron and steel works.
- ArcelorMittal as the No 1 steel producer in the world, has a global and successive approach in the optimization of its product-mix, even if it is by its shrinkage.
- Although steel industry is not a high profit and value added activity, it is connected with a circulation of huge amount of money. It is also a big employment opportunity for the region, giving an opportunity to metal processing industry in the region to become diversified later on, and to straighten demand even through the shrinkage in product-mix of the steel factory.
- ArcelorMittal – Zenica could foresee an opportunity to increase volume of production on basis of product-mix which is in process of shrinkage, to satisfy that market niche in local and regional market.

## 5. REFERENCES

- [1] 11<sup>th</sup> edition of The Making Shaping and Treating of Steel, USA, 1995
- [2] Standard Industrial Classification, SIC 3312 of USA, 1995
- [3] Uzunović F. : Management of BH Steel Company in a war-turmoil region, EUROINFORMS, Istanbul, July 2003
- [4] Uzunović F.: OPTIMISATION OF REHABILITATION THROUGH SHORTCOMINGS OF BH STEEL COMPANY, Neum, Bosnia and Herzegovina, TMT 2004
- [5] Uzunović F. ; Franjić A. ; Žuna Š., : OPTIMISATION OF STEEL PRODUCT-MIX IN REHABILITATION OF THE IRON&STEEL WORKS, 7<sup>th</sup> Research/Expert Conference with International Participations "QUALITY 2011", Neum, B&H, June 01 – 04, 2011