

**OPTIMIRANJE ASORTIMANA ČELIKA U PROCESU  
REHABILITACIJE ŽELJEZARA**

**OPTIMISATION OF STEEL PRODUCT-MIX IN REHABILITATION  
OF THE IRON&STEEL WORKS**

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**REZIME**

*Zbog rata 1992.-1995. u Bosni i Hercegovini i naknadnih ekonomsko-političkih turbulencija, 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 peč davale malu, ali značajnu i neprofitnu proizvodnju. Ta željezara je sada privatizovana i u 91% vlasništvu ArcelorMittal-a, u poratnoj Bosni i Hercegovini, koja više nije država centralnog socijalističkog planiranja, nego u tržišnoj ekonomiji. Ovaj rad ima za cilj da uporedi varijante optimiranja asortimana čelika u različitim vremenskim i ekonomskim periodima, kao i da osvrt na re-inženjering tog optimiranja u procesu rehabilitacije proizvodnih pogona.*

**Ključne riječi:** Optimiranje asortimana, rehabilitacija, željezara

**SUMMARY**

*Due to war in Bosnia and Herzegovina 1992-1995 and political-economical turmoil later on, 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, were giving all that time a small scale, but important, non-profit production. That Iron and Steel Works is now privatized and 91% owned by ArcelorMittal, in post-war state Bosnia and Herzegovina, not any more in a socialistic central planed economy, but in the open market one. This paper is an attempt to compare the variants in optimisation of product-mix through different time periods regarding economy frame-work, as well as to provide an insight into reengineering and the optimisation of steel product-mix in plant rehabilitation process.*

**Keywords:** Optimisation of product-mix, Rehabilitation, Iron and Steel Works

**1. INTRODUCTION**

Due to war in Bosnia and Herzegovina 1992-1995 and political-economical turmoil later on, 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, were giving all that time a small scale, but important, non-profit production. That Iron and Steel Works is now privatized and 91% owned by ArcelorMittal, in post-war state Bosnia and Herzegovina, not any more in a socialistic central planed economy, but in the open market one.

In a post-war period, from 1998 its ownership and name was changed, till 2001 all 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 u. m. facilities were closed, due to the optimization of steel product-mix by majority shareholder Mittal Steel and only the integrated Iron and Steel Works continue to produce. That situation is still on, with some changes in the product-mix plan for 2012. These and some other performances of now ArcelorMittal iron and steel works in Zenica are presented in Table 2.

## 2. STEEL PRODUCT-MIX POSITION AND FUTURE

Data given in Table 2. present an attempt to give the estimation of the company position and its future, analysing three time-variants, including a view to the optimisation of a steel product-mix rehabilitation process, but in Table 1. is given simple SWOT analysis to describe the position and orientation of ArcelorMittal – Zenica.

*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 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 (and Wire Rod) rolling mills were dismantled

To get a better insight regarding previous and future position of that iron and steel works, now ArcelorMittal – Zenica, and the comparison of three time-variants in different performances including steel product-mix, a sort of useful data is given in the table 2.

*Table 2. Comparison of steel product-mix and the other selected performances of the Iron and Steel Works in Zenica, now ArcelorMittal-Zenica*

No	Performance	Year		
		1998 (3,4)	2005 (3,4)	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	2,2 million
3	Output-Production (t/y)	0,25 million	2,2 million	0,8 million Wire rod Ø 5,5-12mm Re/Bars Ø 8-32mm Welded nets Forged products
4	Utilization of Existing Capacities (%)	15	100	40
5	Utilization of Efficient Facilities (%)	15	100	40
6	Utilization of Inefficient Facilities (%)	15	No Inefficient Facilities	No Inefficient Facilities
7	Total Sales (\$US/y)	60 million	865 million	385 million
8	Profit (-Loss) (\$US/y)	- 5 million	15 million	10 million (1,2)
9	Total Exports (\$US/y)	17 million	570 million	90 million
10	Total Number of Employees	12 500	5 500	3 500
11	Total Number of Effective Employees	5 000	5 500	3 500
12	Total Number of Laid off Employees	7500	No	No
13	Total Number of Indirect Employees	10 000	14 000	13 000
14	Total Number of Effective Indirect Employees	2 000	14 000	13 000
15	Total Number of Laid off Indirect Employees	8 000	None	None
16	Company Book Value (\$US)	370 million	410 million	490 million
17	Market Value (\$US)	250 million	650 million	490 million
18	Capital/Loan Needed for optimization(\$US)	100 million	200 million	130 million
19	Invested (\$US)	No	350 million	50-120 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

\* expected

### **3. OPTIMISATION OF STEEL PRODUCT-MIX IN REHABILITATION OF THE IRON&STEEL WORKS**

A lot of limitations, difficulties and shortcomings has been taking place in the rehabilitation process of ArcelorMittal iron and steel works in Zenica. The main among them were/are the following ones:

- Lack of cash before Mittal Steel took over (merged latter to ArcelorMittal)
- Lack of working capital before Mittal Steel took over (merged latter to ArcelorMittal)
- New facilities have to be incorporated according to the existing facilities layout

- Some of the existing facilities have to be modernised
- High taxation policy in Bosnia and Herzegovina
- World economy crisis 2009-2010 caused low demand
- Complicated and slow corporate governance in B&H
- Investment of about 120 million \$ US is 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, 100t capacity EAF having attached radial type CCM for billets and the line for ingots pouring, forging shop 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 and heavy forgings in Bosnia and Herzegovina as well as in the region of former SFR Yugoslavia, even in the world, especially in long products. Accordingly, about 120 million \$ US should be invested in the environmental protection to meet EU environmental requirements.

Besides plain carbon steels and the small percentage of low and medium alloyed steels which have been and were in the product mix, an increased percentage of the second group of the a. m. steels is expected to take place, especially in forged products.

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 it is a big question how to make an optimisation of steel product-mix 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.
- 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, and to straighten demand in product-mix quantity and steel grades.
- ArcelorMittal – Zenica could foresee an opportunity to increase volume of production on basis of its own as well on diversified product-mix to satisfy that market niche in local and regional market.
- Besides an expected increase in variety of steel grades of hot rolled wire rod  $\varnothing$  5,5 – 12 mm, & bars and re-bars  $\varnothing$  8 – 32 mm, there is a strong expectation for such an increase in forged products, because the investment in ingots pouring line is about to be completed and the facilities put into full operation.

#### 5. REFERENCES

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