

CSN IRON ORE BUSINESS – A NEW INTERNATIONAL PLAYER ¹

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Abstract

Casa de Pedra and NAMISA (Nacional Minérios SA) Iron Ore Mines, both belonging to Companhia Siderúrgica Nacional (CSN Steel Company), accounts for the majority of its iron ore supply, producing lump ore, sinter and pellet feeds with high iron ore content and great physical properties. These mines have a vast reserve and ore rated as a world class mining assets. The paper shows a brief history, its current situation as well as the implementation schedule plan with the expansions. The Iron Ore Products performance in sintering and blast furnace process at CSN Steel Company are also described and analyzed.

Key words: Iron ore mine; Iron ore products; Sintering; Blast furnace performance.

CSN – NOVO *PLAYER* NO MERCADO INTERNACIONAL DE MINÉRIO DE FERRO

Resumo

Casa de Pedra e Namisa (Nacional Minérios SA) pertencentes à Companhia Siderúrgica Nacional são compostas por várias minas de minério de ferro. Seus produtos: granulado, sinter e pellet feeds, são caracterizados pelo seu alto teor de ferro e excelente qualidade física. Casa de Pedra e Namisa têm volumosas reservas e seus produtos são ranqueados em alto conceito no Mercado mundial. Este trabalho apresenta um breve histórico do desenvolvimento das minas, a fase atual de produção e os planos de expansão. É apresentado também o desempenho destes produtos nas sinterizações e nos altos fornos da Companhia Siderúrgica Nacional.

Palavras-chave: Mina de minério de ferro; Produtos de minério de ferro; Desempenho de sinterizações; Altos-fornos.

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1 INTRODUCTION

Companhia Siderúrgica Nacional (hereinafter - CSN) is an integrated steel company, currently producing around 5.5 Mtpy of steel, has in the iron ore an important role to provide competitiveness on its steel products final costs. Based on that, CSN has been receiving, since the starts up, iron ore from its own mine, called Casa de Pedra Iron Ore Mine (hereinafter - CdP), which supplies the sinter plants and blast furnaces with sinter feed and lump ore.

The operational sinter plant and blast furnace data, both equipments fed with 100% of CdP products are classified as world class benchmark.

Promoted by the China's steel production raise, CSN has decided to increase the iron ore output production based on two different ways. The first one was the acquisition of some iron ore mines with the creation of a new company called Nacional Minérios S.A. (Namisa). The second one was based on huge investments in Casa de Pedra Iron Ore Mine, in order to allow CdP to, in the next few years, produces almost 5 times more than the current year – 2008.

2. DEVELOPMENT

2.1 Casa de Pedra Current Status

The CdP Mine, which belongs to CSN, is located at Congonhas, State of Minas Gerais, in the Brazilian Iron Ore Quadrangle. It accounts for all CSN consumption of iron ore, producing lump ore, sinter and pellet feeds with high iron content and superior physical properties. The mineral reserves and resources at Casa de Pedra Mine are incredibly vast and it is rated as a world class mine.

The Mine has a total of 8.4 Billion tons (Bt) of resources of iron ore at a grade of 41.3% Fe (36.6% SiO₂).

In 2007, Casa de Pedra produced around 4 Million tons (Mt) of lump ore, 8 Mt of Sinter Feed and 3 Mt of Pellet Feed. The current plant has a capacity of 16 Mtpy. The main processing stages are: crushing, screening, classification, flotation and filtration. The Figure 1 shows respectively the general view of the pits and the operational flow chart.

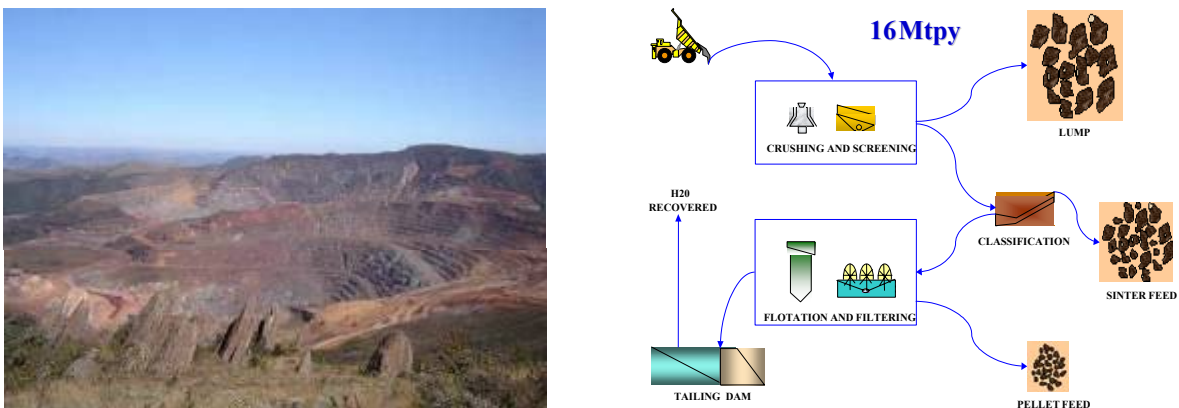


Figure 1: CdP General View of the Main and the Western Pits and the operational flow chart.

2.2 Namisa Current Status

NAMISA mining operations are also carried out in the state of Minas Gerais, in the Brazilian Iron Ore Quadrangle. The Engenho mine, in particular, contributes with the bulk of the NAMISA total iron ore production.

NAMISA holds 09 mining concessions located in the main geostructural units those are part of Pires Beneficiation Plant Complex and Fernandinho Complex.

The Pires Complex encompasses 4 iron ore mines (Engenho, Nogueira Duarte, Argentina and Sobramil), 2 deposits (Pedra Preta and Água Santa), 2 tailing dams, Pires beneficiation plants (main plant and magnetic concentrator) and Pires loading rail terminal (Itacolomy - TFI). The products derived from this complex are Lump Ore, Sinter and Pellet Feeds. Its main processing stages are: crushing, classification, and concentration (Humphrey spirals, cyclones and low intensity magnetic separator). Its current production capacity is 5.5 Mtpa.

In 2007, Pires Complex produced 1.4 Mt of lump ore, 2.2 Mt of Sinter Feed and 0.4 Mt of Pellet Feed.

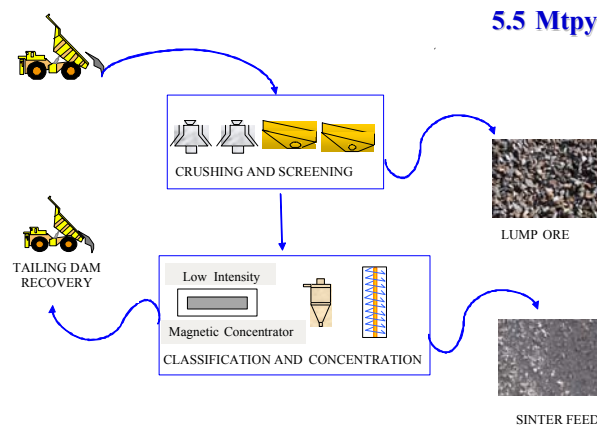


Figure 2: Simplified Pires Complex Production Flow Chart.

The Fernandinho Complex encompasses 01 iron ore mine (Fernandinho I), 2 deposits (Fernandinho II and Cayman), 3 tailing dams, Fernandinho I beneficiation plant (main plant and magnetic concentrator), Fernandinho loading rail terminal (TFF).

The Fernandinho I beneficiation plant currently has a production capacity of 0.6 Mtpy of Sinter Feed and its main processing stages are: crushing, classification, and low field magnetic concentration.

2.3 Itaguaí Port Current Status

CSN (Casa de Pedra and NAMISA) is fully integrated with railroad and port facilities, which are able to supply ore on FOB basis to customers worldwide. The port is located in the state of Rio de Janeiro.

The port facilities include car dumper, conveyor belts, bins, transfer points, stacking and reclaiming lines, stackers, reclaimers, and ship loader. The port started its operation with a capacity of 7 Mtpy in 2007 and since February 2008 it is ramping up to achieve a capacity of 30 Mtpy. At this phase, the port is able to unload 2 trains

simultaneously, reaching a capacity of 11,800 t/h and with a static storage capacity of 1.8 Mt.

CSN also receives all the coal required by its coke batteries from this port.



Figure 3: Itaguaí Current Operations.

2.4 Casa de Pedra and Namisa Resources

The Table 1 below shows the total resources and iron contents of the Casa de Pedra and NAMISA mines and deposits.

Table 1 – Resources and Iron Contents of the Casa de Pedra and NAMISA Mines and Deposits.

	Resources (Bt)	Fe (%)
Casa de Pedra	8.4	41.3
NAMISA	1.7	42.2

2.5 Casa de Pedra Expansion Plan

CSN's Long Term Planning Department has carried out a recent Final Pit Project for the Casa de Pedra Mine considering the same parameters used during the 2006 international audit as well as all lithologies which are technically and economically capable of generating iron ore products. The main difference when compared to the previous study is the possibility to generate products from Compact Poor Itabirites (IPC). The Figure 4 shows the evolution of CdP iron ore mine.



Figure 4: Current Pit, 2012 Pit and Final Pit of CdP Iron Ore Mine.

The current plant is under expansion to 40 Mtpy of capacity. The main processing stages are: crushing, screening, magnetic and spiral concentration, flotation and filtering, according to Figure 5.

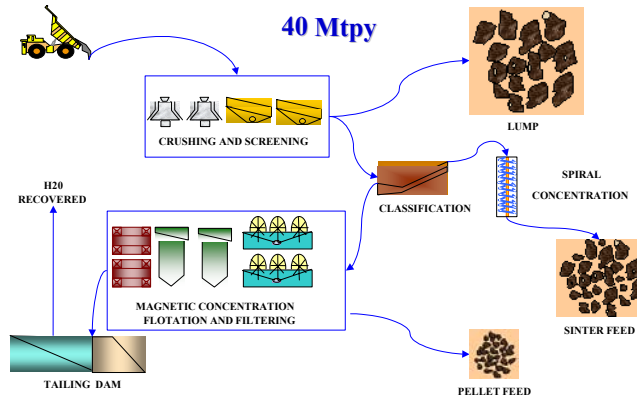


Figure 5: Casa de Pedra 40Mtpy Plant Flow Chart.

Further expansion on CdP shall be achieved through pellet feed production (natural base, with 9% moisture) from two iron ore beneficiation plants which are independent from the existing installations and originated from ROM with high SiO₂ grade.

The project involves all the necessary units for the production of pellet feed (PF), including grinding and concentration, in two plants with capacity of 10 and 20 Mtpy according Figure 6.

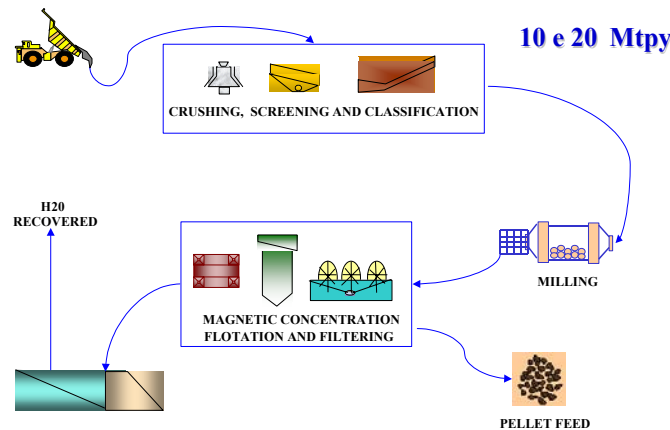


Figure 6: Casa de Pedra 10Mtpy and 20 Mtpy Plants Flow Chart.

After these expansions Casa de Pedra will be able to produce 70 Mtpy of iron ore products.

2.6 Namisa Expansion Plan

NAMISA also has a huge expansion plan based on the existing resources and its facilities implementation has already been approved by the board of CSN.

The Pires magnetic concentrator, whose feeding system will be independent of the current Pires Plant, will improve the capacity from the current 5.5 Mtpy to 8.5 Mtpy. The 3.0 Mtpy increased production will be of Direct Reduction Pellet Feed and Sinter Feed. Its main processing stages are showed in Figure 7.

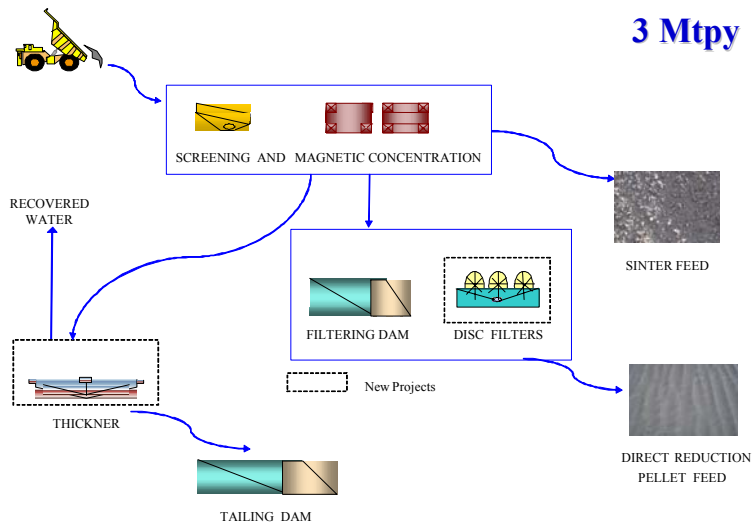


Figure 7: Pires Simplified Magnetic Concentration Production Flow Chart.

The new Fernandinho II Beneficiation Plant will have a production capacity of 3.0 Mtpa of blast furnace Pellet Feed and its main processing stages are: crushing, classification, grinding, and magnetic concentration (WHIMS). Fernandinho II mine (greenfield project) will supply the concentration plant.

Others 03 units will be destined to recover tailing dams (Pires, Fernandinho and CdP) with maximum production capacity of 7.1 Mtpy of Blast Furnace Pellet Feed. These projects are currently underway and they are expected to be fully installed in early 2009. Figure 8 shows the flow chart of these tailing dams recovery plants.

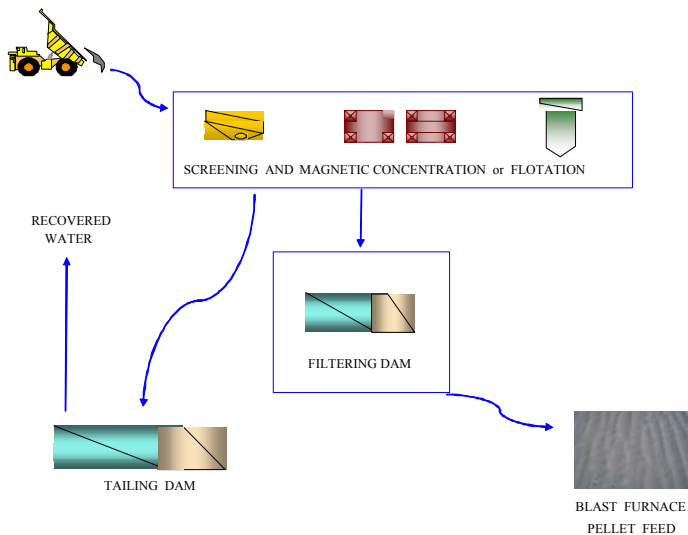


Figure 8: Flow Charts of Tailing Dams Recovery.

The pelletizing project will have a total production of 12.0 Mtpy, through the construction of two pelletizing plants of 6.0 Mtpa each. The project of the first plant will be built in the municipality of Congonhas-MG, close to the loading rail terminal of the Casa de Pedra Mine, starting up in 2011. The second plant, will be started up in 2012.

Pellet feed from CdP tailing dams will feed the first pelletizing plant, while pellet feed from the CdP 20 Mtpy Plant will feed both Pelletizing Plants. The figure 9 shows the pelletizing plant flow sheet.

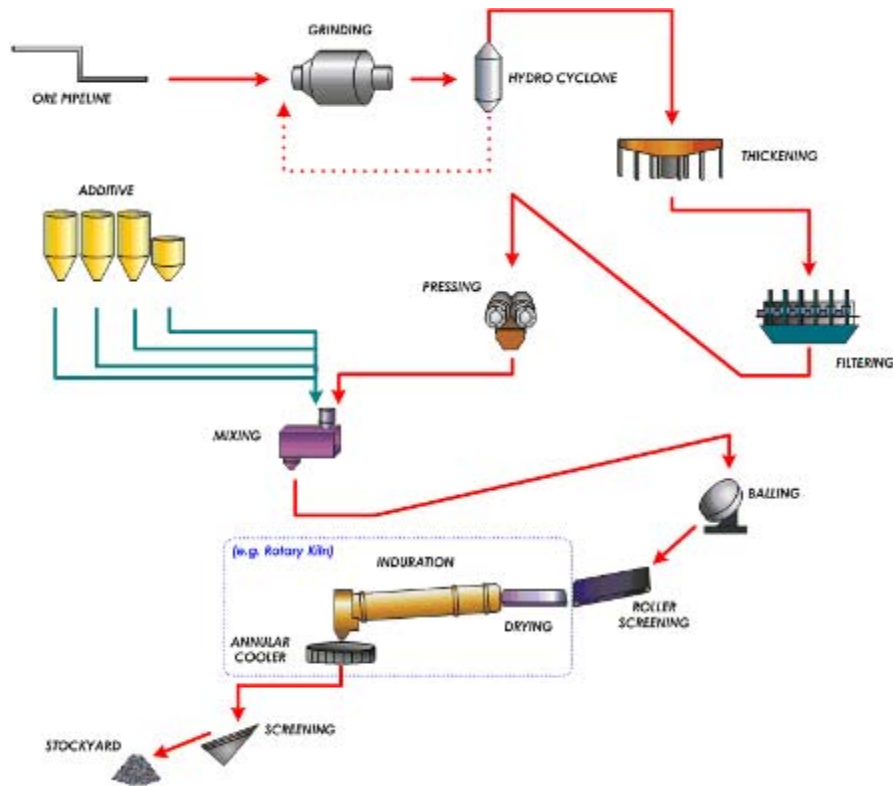


Figure 9: Pelletizing Plant Flow sheet.

2.7 Itaguaí Port Expansion Plan

The expansion of CSN's port terminal at Itaguaí in the state of Rio de Janeiro was divided into 6 phases. The first 2 phases are already in operation.

The phases 3 to 6 will be developed by the installation of the following equipments/facilities: stacker-reclaimers, screening system, belt conveyors, car dumper, ship loader and stockyards.

These phases will increase the port capacity from the current 30 Mtpy to 100 Mtpy, passing through 45, 55 and 65 Mtpy phases.

2.8 Implementation Schedule

Casa de Pedra

Phase II - 40 Mtpy	dez/08
Phase III - 50 Mtpy	dez/09
Phase IV - 70 Mtpy	dez/11

Pelletizing Plants

Pelletizing Plant 1 - 6 Mtpy	mar/11
Pelletizing Plant 2 - 6 Mtpy	jun/12

Itaguaí Port

Phase III - 45 Mtpy	dec/08
Phase IV - 55 Mtpy	dec/09
Phase V - 65 Mtpy	dec/10
Phase VI - 100 Mtpy	dec/11

Pires Complex

Engenho/Santo Antônio (8.5 Mtpy)	out/08
Tailing Dam (CM) - (10.6 Mtpy)	dec/09

Fernandinho Complex

Tailing Dam (CM) - 1,7 Mtpy	jul/09
Concentration Plant - 3.0 Mtpy	jul/10

CdP Tailing Dam - B IV and B V

High Grade Fines (CM) - (3.3 Mtpy)	nov/11
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3 CdP AND NAMISA PRODUCTS QUALITY

The Table 2 shows the chemical and physical quality of the products performed at Casa de Pedra and Namisa facilities. All these products are characterized by low alumina contents, very important item mainly for European and Japanese iron making markets.

Table 2 – Chemical and Physical Quality of the Products

	Sinter Feed CdP	Pellet Feed CdP	Lump Ore CdP	Sinter Feed NAMISA	Concentrate NAMISA	DR Pellet Feed * NAMISA
Fe	64,2	67,0	64,7	64,5	66,0	67,3
SiO ₂	4,8	1,9	3,5	4,9	3,5	1,6
Al ₂ O ₃	1,0	0,7	1,1	1,0	0,6	0,7
P	0,045	0,045	0,057	0,060	0,055	0,035
Mn	0,55	0,40	0,50	0,30	0,20	0,40
LOI	1,4	0,8	1,9	1,6	1,1	0,8
<hr/>						
+1,0mm	52,0			42,0		
-0,150mm	20,0			28,0		
<hr/>						
+0,150mm		6,0			25,0	15,0
-0,045mm		45,0			30,0	35,0
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+31,0mm			18,0			
-6,3mm			12,0			

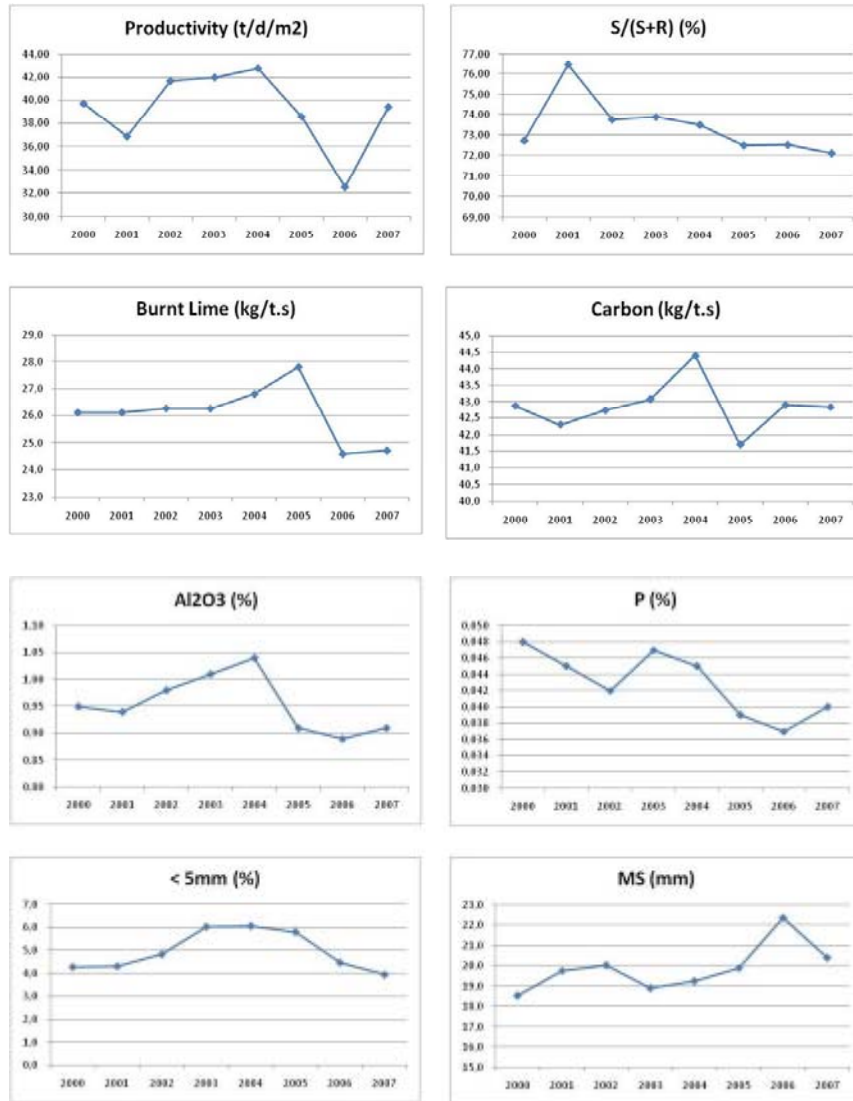
1. Size distribution cumulative retained (%)
2. Expect quality at port

* DR - Direct Reduction

4 SINTERING AND BLAST FURNACE OPERATIONAL DATA/RESULTS

The following graphics show the performance of 100% feed of CdP iron ore products at CSN's sintering and blast furnace plants. The main results that we would like to emphasize are the high productivity of such metallurgical equipments as well as the excellent chemical quality of hot metal and blast furnace slag. The data are related to a sinter plant with 190m² and a blast furnace with 4,237m³ (inner volume).

Sinter Plant – Annual Average Operational Data from 2000 to 2007

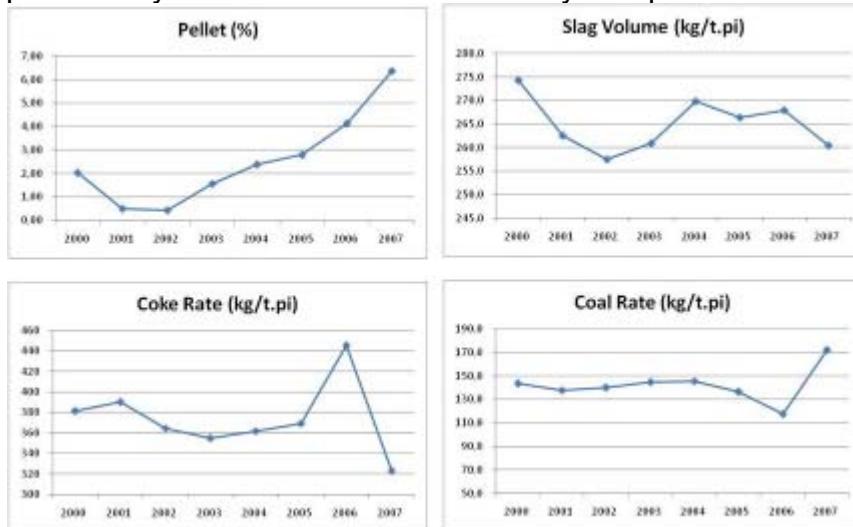


- High level of sinter productivity with low specific consumption of carbon.
- Low alumina values can guarantee better sinter metallurgical properties (RDI).

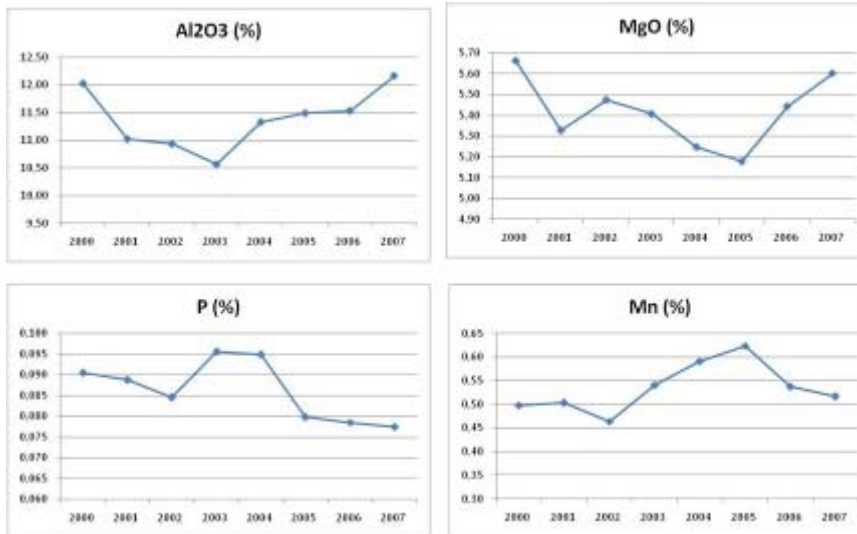
Blast Furnace – Annual Average Operational Data from 2000 to 2007



- High Blast furnace productivity with 75 ~ 80% of elaborated burden (sinter + pellet).
- The lower productivity in 2006 has been caused by an operational accident.



- Low slag volume values with high consumption of coal.



- Lower (Al₂O₃) and [P] values coming from the consumption of CdP Iron Ore Products.
- All the [Mn] required also comes from CdP iron ore products.

5 CONCLUSIONS

The steel market must continue increasing for the next years and for this reason also the iron ore demand. CSN through its controlled companies, CdP and Namisa, is able to answer such supplying increasing with high grade sinter and pellet feeds, lump ore and in a brief future also pellets with a integrated logistic system.

The performance of these iron ore products is witnessed by the excellent operational data presented by CSN's sinter and blast furnace plants.