“Do Russian Steel Producers really have a competitive advantage?”

L. Iperti

FOREWORD

The total steel production capacity of the Russian Iron & Steel industry is well above the current needs of the domestic market allowing Russia to be one of the largest net steel exporters. Its export skills have been developed further in recent years due to the huge increase in steel demand in the world.
Russian steelmakers have considerably increased their profits, also thanks to the advantage of owning, directly or indirectly, iron ore and coking coal mines and of purchasing electricity, natural gas and labour at more competitive prices than those in the majority of other countries.
The cash generated has been partially reinvested, mainly in upgrading crude steel production plants but also in new finishing facilities, although the Russian steel industry needs to invest more money in order to stay profitable in the long term.
The question is: will this high profit situation change in the next few years? Will Russia be able to continue exporting growing volumes of steel even when the new plants now under construction all around the World, especially in China, start production?
Will the Russian steel industry still be competitive?
I will try to answer these questions also through a comparison with the situation in Latin America where the Techint Group is deeply rooted and where similar conditions of competitive advantage exist.

THE SUCCESS OF THE RUSSIAN IRON & STEEL INDUSTRY

In the last 2-3 years the Iron & Steel industry in Russia has achieved excellent results in terms of steel export volumes and financial returns.
Russia is an excellent steel exporter of semi-finished products, but it is also a major exporter of finished products.
In 2004 Russian iron & steel industry exported 34 million tons of semi-finished and finished steel products, corresponding to 53% of its crude steel production.

L. Iperti - *Techint Technologies*

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Figure 1 – Russian crude steel production and export of semi-finished and finished steel products.

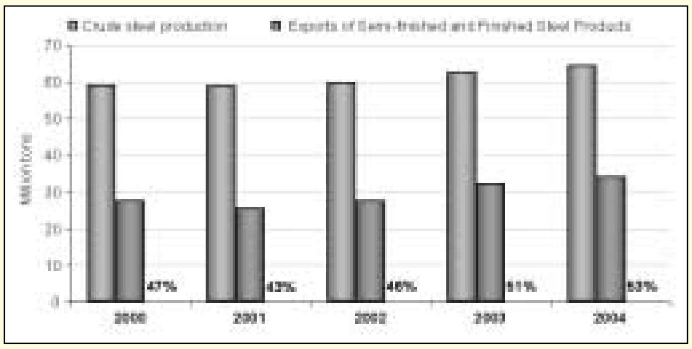


Figure 2 – Top 10 Countries for HR Coil Export in 2004 and % of national production.

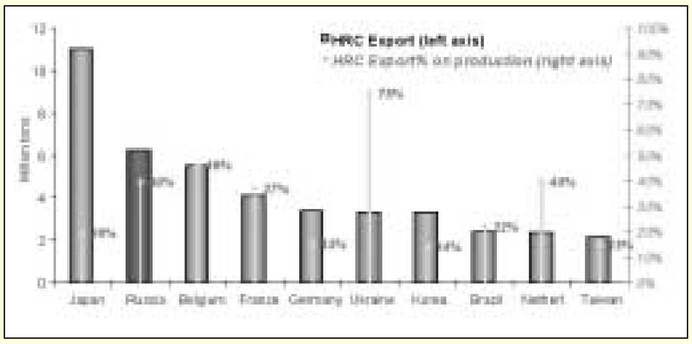


Figure 3 – Russian crude steel production by Companies, 2004.

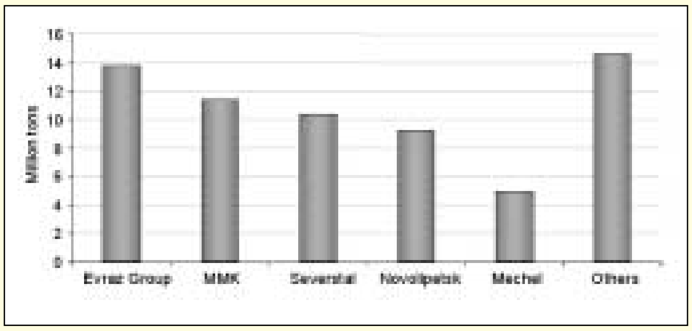
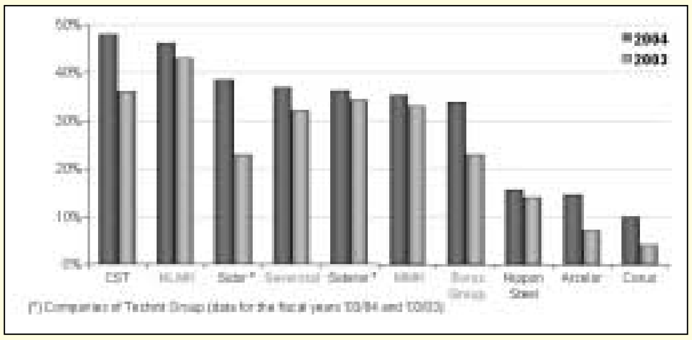


Figure 4 – EBITDA % in 2004 and 2003 for Russian and international steelmakers.



If we consider Hot Rolled Coil, in 2004 Russia was the second largest exporter in the World only after Japan, exporting 40% of the HR Coil produced internally compared with 20% of the same value for Japan. Ukraine is the 6th exporter in the World, exporting 75% of its own production.
Russian Iron & Steel industry is highly concentrated. In 2004 the top 5 steelmakers have produced 50 million tons of crude steel, thus counting for 77% of the 64 million tons produced in Russia.
Considering the EBITDA / Sales ratio, in 2004 and 2003 the 4 largest Russian companies achieved extraordinary results similar to the ones of Latin American steelmakers.

KEY FACTORS OF THE RUSSIAN COMPETITIVE ADVANTAGE

Russian steelmakers have obtained such impressive results through the implementation of a low-cost positioning strategy.
The key factors that bring the national Iron & Steel industry towards success are the following:
- low cost production factors,
- high rate of concentration of the Russian steelmakers.

The high level of concentration of Russian steelmakers, quite unusual in the Iron & Steel industry, gives them strong negotiating power in the value chain that allows them to buy at very competitive prices and sell semi-finished and finished products all around the world at market prices.
In order to highlight the low costs of production factors for Russian steelmakers, the operating costs for slab production in different geographic areas have been compared, highlighting the incidence of each factor involved.
The conclusion of the analysis is that Russian and Latin American steelmakers have lower operating costs, confirming that these 2 areas have significant advantages in terms of production factors.
A brief description of the situation for each factor follows.

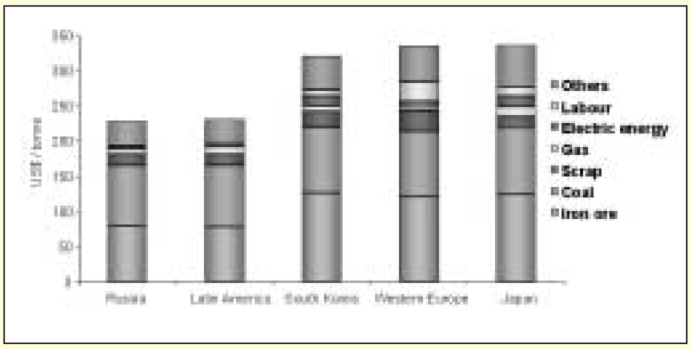


Figure 5 – Operating cost for slab production by integrated mills (early 2005).

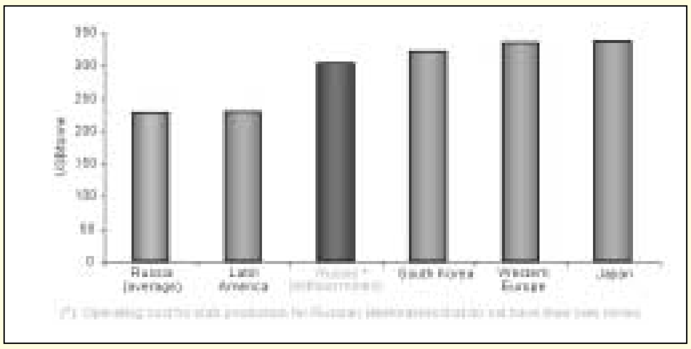


Figure 6 – Operating cost for slab production by integrated mills (early 2005).

- Russia produces nearly 100 million tons of iron ore, less than 10% of world production.
  The majority of Russian steelmakers use iron ore pellets or concentrate from refining facilities located nearby. However, due to current shortage of iron ore, some steel producers have to buy the ore from mines located very far from their steel facilities, sometimes using imported mineral (for instance from Kazakhstan).
  Russian steelmakers already own several mines, but they are trying to increase control over the raw material supply chain through upstream acquisitions, in order to ensure the mineral at low and stable prices. The top 5 Russian steelmakers are therefore struggling to acquire the few iron ore production companies left in the market (in 2004 only NLMK was able to supply 100% of its iron ore needs internally).
- Russian production of coking coal is around 90 million tons, representing nearly 20% of the world production.
  The coal situation is similar to iron ore, with the top 5 steelmakers moving towards an upstream integration (through both acquisitions and developments of new green-field mines: for instance Evraz Group has acquired the Raspadskaya Coal Mine and is developing the Denisovskaya coal mine).
  However, in the medium term there should not be threats of coal shortages.
- In Russia there is plenty of obsolete ferrous scrap, concentrated in few areas.
  In 2004 international scrap prices increased considerably, reaching a peak in the second half of the year. That is why Russia raised its scrap exports from 6.9 million tons in 2003 to 12.4 million tons in 2004, becoming the 1st scrap exporter in the world. In the first part of this year the scrap price decreased slightly.
  A few years ago the Russian government imposed an export duty for ferrous scrap, which has contributed to creating a difference between the price of local scrap and that available outside Russia. This duty is providing and could provide even more additional competitive advantages for Russian steelmakers.
- Russia is the first country in the world in terms of production (580 billion cubic meters) and identified reserves (47 trillion cubic meters) of natural gas.
  That is why the cost of natural gas in Russia is the lowest compared with the cost in other geographic areas: 1 to 8 in relation to Western Europe and half the price in Latin America.
- The cost of electricity is also low, being 1 to 3 compared with Western Europe.
  Compared with Latin America, the price is at the same level, but, due to inefficient production processes and equipment, it counts for a higher percentage on operational costs.
- The labour cost in Russia is very competitive, being 3 times lower than in Latin America and 15 times lower compared with Western Europe.

HOW TO KEEP THE RUSSIAN COMPETITIVE ADVANTAGE IN THE FUTURE

The above-mentioned factors give Russian steelmakers an important competitive advantage.
But in the future some changes in the international and local market could considerably narrow down this advantage.
Besides Latin America, other developing countries are highly competitive steel producers. For instance, India is becoming a new competitor in the low-cost market segment, since it is possible to find raw materials at very competitive prices, and the largest international steel players (Arcelor, Mittal Steel, POSCO) are planning to construct their own plants (mainly for slabs and HR Coil) there.
Moreover, due to inefficient national transportation system, Russian steelmakers competitiveness could decrease in selling semi-finished products since price could be considerably affected by transport costs.
Currently, Russian steel consumption is not high (180 kg/capita compared with 400-500 kg/capita in Europe and North America), but if it develops in the future local steelmakers could face some problems in producing steel at the quality level requested by the market and if export conditions worsen, they will be forced to decrease their production volume.
In the last 3 years, from 2002 to the first quarter of this year, market prices of iron ore and coking coal in Russia have roughly tripled. Therefore Russian steelmakers that don't have a captive market for ore and coal supplies run the risk of compromising their competitiveness.
In order to overcome the above threats

and keep up current good results and high level of profit, Russian steelmakers should:

- develop new mines to respond to the decreasing availability of low priced iron ore;
- upgrade their plants in order to increase efficiency and productivity, minimizing the overall operative costs;
- exploit the high availability of scrap and the favourable prices of natural gas and electricity (although with the upcoming admission to the WTO, these prices will increase to near the prices of the rest of World);
- have greater operational flexibility in terms of being able to use different raw materials according to the lowest source price at the time.

In order to face these challenges, Russian steelmakers have to keep investment levels high both in upstream integration and in upgrading their plants, moving towards updated steel production technologies and finishing facilities.

In particular, Russian steelmakers should upgrade their crude steel production plants investing in technologies that require limited capital outlay, which are as profitable as possible in terms of pay back time and rate of return, and that make it possible to reach high levels of efficiency, quality and flexibility.

All these could be achieved through an increased use of Electric Arc Furnace (EAF) technology.

The benefits of an enlargement of the EAF base for Russian steelmakers, compared to "blast furnace - basic oxygen furnace (BF-BOF)" installations, are the following:

- Less investment cost per ton of new installed capacity: for example, the cost per ton of new capacity in western countries for the BF-BOF alternative is 450-500 USD/ton versus 120-140 USD/ton for EAF, for the same technology level and construction quality.
- Less energy consumption to produce steel and, consequently, lower environmental impact: whereas the BF-BOF route requires around 15.9 MBTU per ton of steel ready to cast, the EAF route requires only 6.3 MBTU for the same product;
- Lower production costs, due to the larger exploitation of production factors (natural gas, scrap and electricity) that have a favourable market condition in Russia;
- Higher operational flexibility: the EAF is a much more flexible tool than the BF-BOF, being able to handle different sources of raw material (scrap, pig iron, DRI, HBI) in different combinations. Therefore it is possible on the one hand, by adopting the most convenient mix of raw materials at all times, to even out the constant threat of price fluctuations, and on the other hand to allow better control of steel production output and stock levels following the ups and downs of the world economic mood. The typical operational flexibility of the EAF steelmaking route is especially prominent in the modern mixed BF-EAF installations, where part of the hot metal produced in a blast furnace is charged into the EAF. Moreover, the EAF can be started and stopped very quickly either to vary the production rate or to change the steel grade campaign.

In order to overcome the dependence on BF-BOF route and enlarge the raw material base, Russian steelmakers have to install gas or coal direct reduction plants (DRI), according to the available energy source.

In 2004, the total annual world capacity of DRI production was nearly 70 million tons. In Russia there are only a few plants with a total capacity of 3 million tons, although there are some signs of shift in this direction.

For instance, a few months ago the government of Kaliningrad came up with its proposal for the location of a new 1.5 million tonne-per-year green field steelworks that will produce slab starting from a direct reduction plant using natural gas.

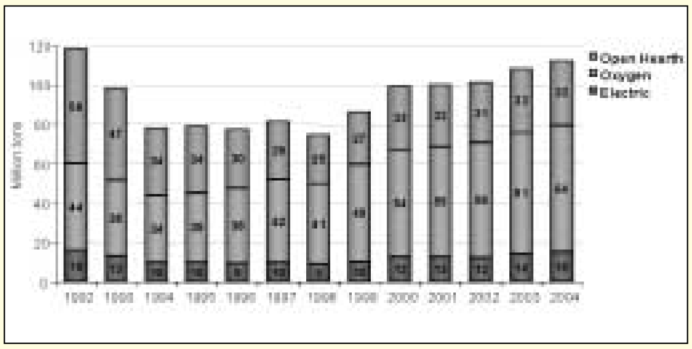


Figure 7 – Crude steel production by process in the Countries of the Former Soviet Union.

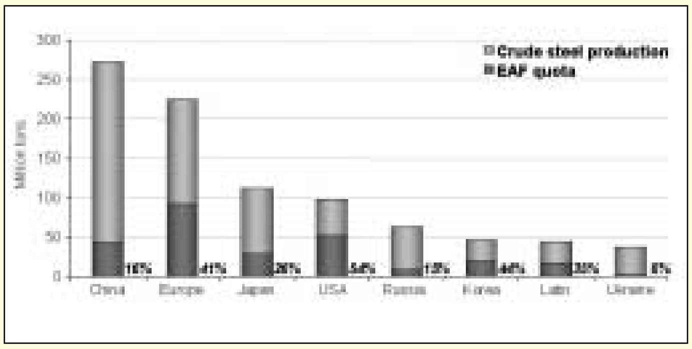


Figure 8 – 2004 crude steel production in selected Countries and EAF quota.

Table 1.

Average[(1)] (Europe + USA + Japan)	1990	2004	% increase
Furnace Capacity (Ton / heat)	86	115	34 %
Transformer Power (MVA)	60	85	42 %
Furnace Productivity (Ton / hour)	61	103	69 %

(1) *Data collected from an EAF panel in Europe, USA and Japan*

CRUDE STEEL PRODUCTION VIA EAF

In Russia, crude steel production via EAF has the potential to grow considerably.

In 2004, the countries of the Former Soviet Union produced 112 million ton of crude steel, only 13 % of which through electric arc furnaces. Russia produced 64 million tons, 10 million tons (15%) of which through electric arc furnaces.

Moreover, Russia and Ukraine produced 33 million tons of crude steel through Open Hearth Furnaces, being the two main countries in the World that still utilize this obsolete process.

Considering crude steel production in other geographic areas in 2004, we can see that, except for China, the EAF percentage is 2 or 3 times the value in Russia, and up to nearly 10 times if we compare Ukraine and USA.

China has a low EAF production rate for several reasons, but mainly due to scrap shortages and, in certain regions, an inadequate electrical grid.

In the last 10-15 years, EAF based technologies have made an impressive progress to reach current very high levels.

Nowadays, the increased furnace capacity, the transformer power in line with the available electrical grid, the improvement of productivity through the optimisation of the chemical process and the extensive use of DRI, HBI and hot metal

as raw materials lead to the installation of EAF steel plants in locations and for applications previously unforeseen (high quality flat steels, special grades) that are more typical of BF-BOF steelmaking.
Table 1 shows how the main features of EAF evolved in highly industrialised countries between 1990 and 2004.
Productivity has grown nearly twice as much as furnace capacity and transformer power. This has been the result not only of improvements in operating procedures, but also of the massive utilisation of the chemical package.
Nowadays, in order to get the maximum flexibility using different raw materials according to the specific price conditions, many integrated plants around the world are evaluating the possibility of making part of their production using the EAF route through a mixed BF-EAF installation rather than adding a new BF-BOF or relining an old one.
Using part of the hot metal produced in an existing blast furnace and charging it into the EAF can be of benefit to operations. In fact, bringing thermal energy into the EAF reduces energy consumption and increases productivity.
A very illustrative example of hot metal charging is the Wheeling Pittsburgh project, in the USA, where the trend towards the utilisation of EAF technology with hot charge is confirmed.
Wheeling Pittsburgh executives decided to shut down their blast furnace n.1, which was due for major relining/revamping work, and to switch into an EAF-based shop. Wheeling Pittsburgh benefits from the higher energy efficiency and the flexibility added by the new melting unit. In fact, its president and CEO, James Bradley, declared in an interview to Steel News that the newly-added flexibility will enable the company to run efficiently in both good and lean times for the steel industry.
The main operating data of the new Wheeling Pittsburgh meltshop are: i) EAF tapping size of 225 tons, ii) Transformer of 140 MVA, iii) Productivity from 225 ton/h (100% scrap) to 295 ton/h and iv) Raw materials: hot metal, scrap, pig iron, DRI and HBI.
Wheeling Pittsburgh uses the Consteel® system for crude steel production through EAF, as shown in figure 9.
The Consteel® system performs the continuous charging of scrap in the EAF by means of a conveying system that connects the scrap yard to the EAF. The scrap is loaded onto the conveyor, and before reaching the furnace it enters the preheating section. In this area, the scrap is heated by the hot gases exiting the EAF and moving in the opposite direction to the scrap. During the continuous feeding operations, the steel bath in the EAF is kept constantly liquid and the scrap entering the furnace is melted by immersion.

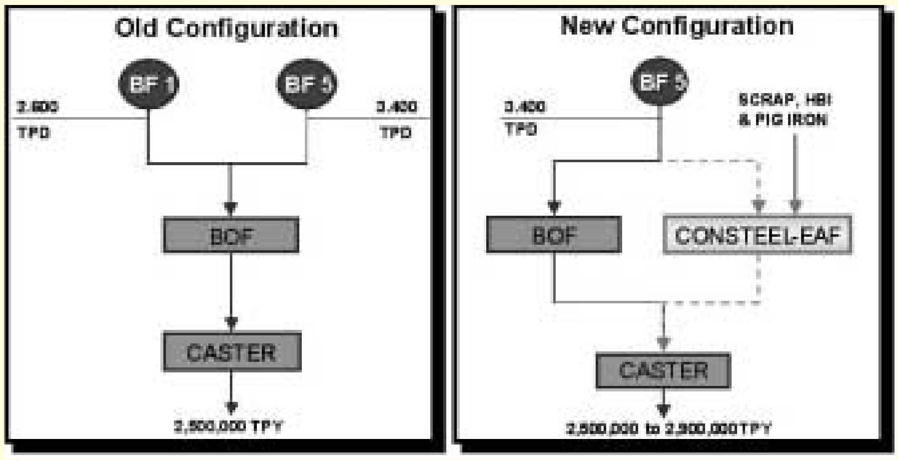


Figure 9 – Old and new configuration for Wheeling Pittsburgh.

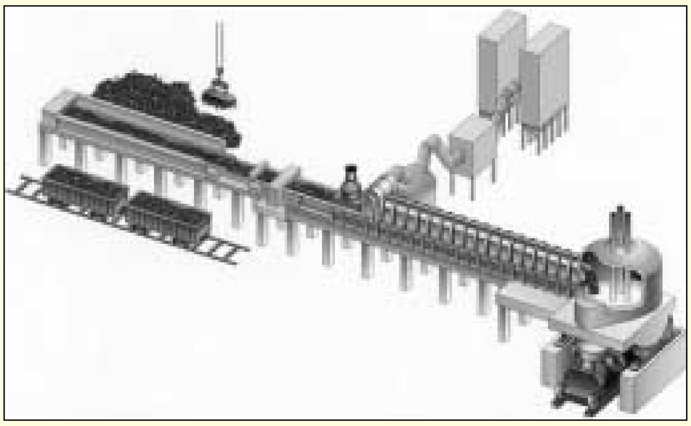


Figure 10 - The Consteel® System.

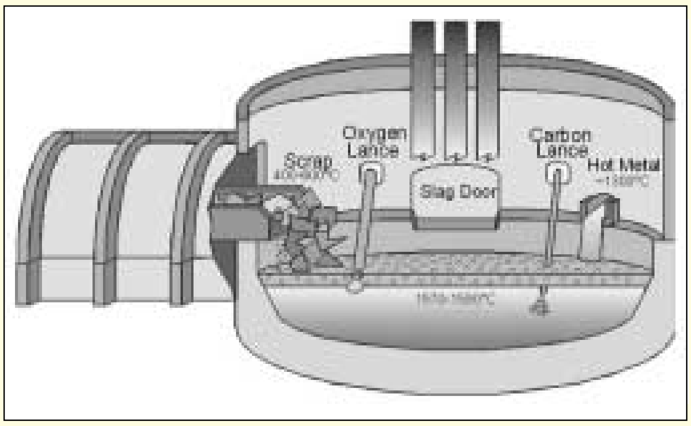


Figure 11 – Hot metal charging concept (Section view).

Several years' experience has shown that to charge hot metal into a top-charged EAF is made difficult by the risk of a strong reaction in the bath. This problem is related to the interaction of oxygen and carbon.
Controlling the carbon content in the bath by continuous feeding of the EAF through the Consteel® system seems to be the most efficient way to avoid the oxygen/carbon reactions in the bath, thus achieving more energy efficient operations, fewer problems for equipment and safer operation for personnel.
Hot metal charging into the EAF is a practice utilized largely in China. In fact for 5 EAF + Consteel® system of the 9 installed it's foreseen this possibility.
The electric route for steel production can always rely on new further improvements.
A new highly innovative technology has been developed, enabling the process control of the EAF. This technology is based on continuous real-time off-gas measurement and close loop control for setting the injection system of the chemical package. The system, called Goodfellow Expert Furnace System Optimisation Process (EFSOP™) leads to substantial savings for steelmakers, both in combustion efficiency and in productivity increases. The system is presently used in ten EAF, in Canada, USA, Mexico and the UK. In Mexico, combining off-gas analysis with control of chemical injection system and multifunctional burners has resulted in a 6.5% reduction of electric arc steelmaking costs.

TECHINT EXPERIENCE

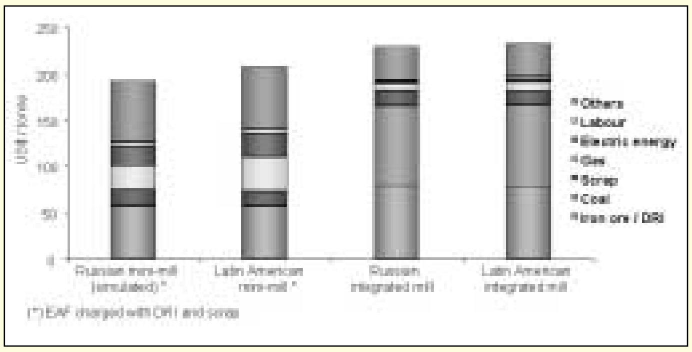
Everything I stated above comes from the long experience of the Techint Group.

Techint produces steel in a number of countries but our production facilities are mainly located in Latin America (Argentina, Venezuela, Mexico). Techint produces 12.2 million tons of crude steel, only 23% of which is by blast furnace and basic oxygen furnace. The remainder is produced by electric arc furnaces charged mainly with DRI from our plants (Venezuela and Argentina), and also with scrap (Italy and Mexico).

The production prices in Latin America are as favourable as in Russia, but the possibility of producing steel through the direct reduction plant + electric arc furnace route enables us to produce at very low operating costs.

In principle, we do not export semi-finished products, but our strategy is to sell high value added products in order to internally retain the advantage of low production costs.

Figure 12 - Operating cost for slab production (early 2005).



CONCLUSION AND FINAL CONSIDERATIONS

Russian steelmakers could further increase their competitiveness producing steel through EAF fed with home-produced DRI and scrap. What the future will be for the Russian iron & steel industry depend upon the decisions taken by steelmakers. I'm confident that Russian steelmaker will increase rolling and finishing plants. Produce coils and finishing products will be an essential requirement if they do not want to be forced to export slabs and billets in a world that will be full of semi-finished products at low and unprofitable prices. And crude steel will be produced in a more efficient way through the larger use of the electric arc furnace technology.

In arrivo la 6° edizione del Corso modulare avanzato

"Gli acciai inossidabili"

E' tradizione che il corso modulare avanzato su "Gli acciai inossidabili" venga organizzato dall'Associazione Italiana di Metallurgia, con la collaborazione del Centro Inox. Come consuetudine, anche questa 6ª edizione di questo corso è realizzata a un triennio da quella precedente, così da offrire al personale delle aziende del comparto "acciai inossidabili" l'opportunità di approfondire le proprie conoscenze nel settore e consentire nel contempo un'azione formativa alle loro nuove leve operative. Essa è articolata in sessanta lezioni suddivise in due moduli di trenta lezioni ciascuno.

Il primo modulo - dedicato alla metallurgia, alle caratteristiche, alla corrosione, alla produzione e al mercato degli acciai inossidabili - è programmato nei giorni 25 – 26 gennaio e 1 – 2 – 8 – 9 febbraio 2006 ed è propedeutico al secondo modulo. Esso pone le basi per una conoscenza approfondita degli inossidabili, partendo dalle loro caratteristiche intrinseche, per spaziare sulla normativa ad essi inerente, alle differenti tipologie di inossidabili (martensitici, ferritici, austenitici, duplex, indurente per precipitazioni), ai trattamenti termici, alla meccanica della frattura. Il loro comportamento alla corrosione è sviluppato partendo dalle tematiche generali sulla passività per essere approfondito in ogni tipologia corrosiva. Seguono un'articolata presentazione del comportamento di questi materiali alle elevate temperature e agli aspetti metallurgici connessi con la solidificazione della fase liquida, con le deformazioni a caldo, a freddo, con l'asportazione di truciolo, con la saldatura e con la sinterizzazione. Concludono il modulo una panoramica sui processi e gli impianti produttori, sulla garanzia della qualità dei prodotti siderurgici inox e una prospezione sul mercato attuale degli inossidabili e sulle sue prospettive. Grazie al successo dell'ultima edizione, per mettere a contatto i partecipanti con la realtà del "mondo inossidabile" italiano, si è deciso di riproporre l'iniziativa di una serie di "tavoli informatori" che saranno presenti, a cura di aziende sponsorizzatrici, durante le prime due giornate del corso, il 25 gennaio 2006.

Il secondo modulo, anch'esso di trenta lezioni, sarà dedicato a lavorazioni, messa in opera, criteri di scelta e di progettazione, nonché alle applicazioni degli acciai inossidabili e si terrà nei giorni 7 – 8 – 14 – 15 – 21 – 22 giugno 2006.

Esso è la diretta conseguenza applicativa del primo ed è dedicato dapprima alle tecnologie produttive, quali la laminazione a caldo e a freddo, la fucinatura, l'estrusione, la produzione dei getti e dei sinterizzati. Successivamente sono trattate le tecnologie applicative per deformazione plastica a caldo e a freddo di questi materiali (stampaggio, imbutitura, piegatura, profilatura, trafilatura, ricalcatura e rullatura ecc.), per asportazione di truciolo (tornitura, fresatura, rettifica ecc.), nonché quelle non convenzionali, le tecniche di saldatura, di unione e quelle di finitura superficiale. Seguono i criteri di scelta e di progettazione in funzione degli impieghi, visti anche in connessione con i costi dei prodotti finiti riferiti ai cicli economici di vita. Sono infine trattati i diversi settori applicativi spaziando dalla chimica, allo sfruttamento dei giacimenti di petrolio e di gas, anche off-shore, alla tutela dell'ambiente, alla produzione di energia, dai trasporti all'industria alimentare, alla tutela della salute, per terminare con quelle connesse con le strutture, l'architettura, l'arredo urbano e il restauro.

Anche per questo secondo modulo è prevista la presenza di "tavoli informatori" durante la prima giornata del 7 giugno, funzionanti in parallelo alle lezioni. Le lezioni sono affidate a un team di docenti specializzati, di chiara fama, appartenenti a Università, Enti di studio e di ricerca, Industria, non facilmente reperibili sul mercato della formazione e dell'informazione. In questo modo il partecipante può fruire d'un contatto multidisciplinare con un ampio mix di esperti che favorisce lo scambio d'idee e di esperienze, anche nel corso dei dibattiti condotti durante e al termine d'ogni lezione. Il costante collegamento tra produzione, trasformazione e mercato offerto da questa iniziativa culturale, tipicamente italiana, che si sviluppa ormai da trentotto anni, ha contribuito a portare il comparto italiano degli inossidabili ai primi posti nella produzione e nella trasformazione di questi materiali nell'ambito dei paesi maggiormente industrializzati del mondo.

Coordinatore e Direttore del Corso è il Prof. Gabriele Di Caprio.

Per informazioni e registrazione al corso, rivolgersi alla Segreteria organizzativa della ASSOCIAZIONE ITALIANA DI METALLURGIA - AIM
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