

The Socio-Economic Impact of the Nickel Industry in the EU:

Italy Country Report

Prepared for

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1. NICKEL – AN ENABLING TECHNOLOGY

Nickel, because of its wide-ranging properties and applications, is an ‘enabling technology’, not simply an industry processing primary materials. Most nickel is combined with other metals to form alloys with particular properties such as ductility, very high temperature strength and corrosion resistance, as well as magnetic attraction and controlled expansion.

As a result of these and other properties, nickel brings significant benefits to producers of finished products in a wide array of end-uses ranging from cars, aeroplanes, ships, power generation, process equipment, information technology, and buildings on the one hand, to consumer appliances, cutlery, coins, and medical appliances on the other.

In turn, this widespread use of nickel technology generates an extensive range of important socio-economic benefits for Italy and its citizens:

- **Jobs and wealth** are created and sustained through the operation of a complex ‘value chain’ whereby semi-processed nickel is progressively converted into more complex products and end uses;
- **Sectoral competitiveness** of important Italian-based industries is strengthened through the contribution that nickel-based technologies make to firm-level innovation and operating efficiency;
- **Economy-wide economic performance** is enhanced because nickel-based technologies help improve resource efficiency and, because of their role as platform technologies, they provide a basis, grounded in decades of know-how and experience, for both incremental and radical innovation;
- **Sustainable economic development** is supported because nickel-based platform technologies help deliver ‘real world’ solutions to environmental challenges, enabling citizens and businesses to respond to regulatory incentives, exploiting fuel sources more efficiently and with fewer emissions, and underpinning the progressive transition towards new sources of energy.

2. JOBS AND WEALTH – THE NICKEL VALUE CHAIN

2.1. The Nickel Value Chain

Nickel brings significant benefits to manufacturers of alloys and to producers of many finished products. Nickel therefore sustains a complex value-chain that creates and sustains jobs, whilst also creating output and wealth.

The value chain for nickel is complex. It involves three distinct tiers. These are the ‘Direct Nickel Industry’, ‘First Use Sectors’, and ‘End Use Applications’.

The ‘**direct nickel industry**’ comprises nickel mines, smelters and refineries. It also includes the transport and logistical activities associated with the movement of nickel within the EU and the activities associated with the importation of raw materials for

refining (ore concentrates, nickel matte and nickel oxides) and refined nickel. The direct nickel industry also includes all activities associated with the recycling of nickel-containing products.

However, only a small amount of nickel is used as a product in its own right. Most often, it is usually combined with other materials to produce nickel-containing alloys (such as stainless steel) with distinct performance characteristics. Nickel is also used as a plating material, and to produce special chemical products for batteries and catalysts. These are known as **'First Use'** applications.

The nickel-containing alloys produced during the 'First Use' stage are sold to product manufacturers both directly and indirectly. Those that are sold indirectly go via **'Intermediaries'**. These include distributors who serve smaller customers and fabricators, metal formers and surface engineering companies who undertake specialist services such as metal shaping, forming and sub-assembly.

Product manufacturers use the nickel-containing alloys as part of their manufacturing process. This group comprises a large number of manufacturers of components, sub-assemblies, and other products that are then used in the manufacture of further products. Collectively, they are known as **'End Use' applications'**.⁴ In many End Use applications, nickel plays a critical role in achieving functional or cost performance.

2.2. The Direct Industry in Italy

- Over the last 20 years, the market in Italy has expanded substantially as many new uses of nickel have been developed. Total Italian use of nickel totalled approximately 120 kte in 2007. This represents 17% of total EU use.
- Demand is satisfied in Italy through a combination of imports of refined nickel and recycling of existing nickel.
- Primary nickel is not produced in Italy. Substantial quantities of refined nickel are imported into Italy, mainly from outside the EU. In 2007, net imports were 54 kte.
- The remainder of Italian demand is satisfied through recycling of scrap (particularly stainless steel) to produce re-usable nickel. The majority of this recycled nickel is derived from scrap collected from within Italy. It is estimated that around 66kte (Nickel Units) of recycled nickel was collected in Italy in 2007. Recycled nickel comes from the recycling of end of life products and through the re-use of waste produced during the First Use manufacturing and fabrication process.
- The direct nickel industry in Italy produces approximately Euro 1.8 billion in value-added, through its recycling activities and other activities associated with the importation and transportation of nickel.



- Employment in the nickel industry and nickel recycling activities in Italy was approximately 3,000 in 2007. This includes people directly employed in recycling activities, and people employed in support activities such as importation and logistics.

Additionally, nickel-related activities contributed a further 1,000 jobs to the economy through income and supplier 'multiplier' effects. (Each Euro of expenditure on goods and services by companies and employees in the nickel industry generates additional employment in other sectors, especially services.)

2.3. First Use in Italy

- The main primary uses of nickel are in the production of nickel-containing alloys (stainless steel, alloy steels, non-ferrous alloys, and foundry products), nickel plating, and 'other' products such as nickel cadmium batteries, chemicals, and catalysts.
- More than 80% of all nickel used in Italy is concentrated in one sector- stainless steel, where nickel is the critical 'enabling technology' that facilitates a number of key benefits for stainless steel producers. These include corrosion resistance, formability and 'weldability'.
- Around 1.7 million tonnes of stainless steel and other alloys produced in Italy are *critically dependent on* nickel. These have a sales value of approximately Euro 5.2 billion.
 - Acciai Speciali Terni (AST), a wholly-owned subsidiary of Thyssen Krupp, has a major flat products plant at Terni in Italy. The Terni facility is a well-established, world-class, large, fully integrated plant with 1.5 million tonnes per annum melt capacity. Part of the hot rolled output is exported to Thyssen Krupp plants in Mexico and China, whilst the remainder is consumed within Italy.
 - There are also a substantial number of specialist Italian stainless steel producers including Acciarerie Valbruna (at Vicenza and Bolzano), Cogne Acciari (Aosta), Italfond (Bagnolo Mella), Macegaglia (Gazoldo degli Ippoliti), Metalcam (Breno), Metallurgica Luigi Pessina Acciari (Carronno Pertusella), Rodacciari (Bosisio Parini) and Trametal (Genova).
- Italy is a producer of nickel-based non-ferrous alloys, castings and components for demanding applications in the automotive, consumer goods, aerospace, power generation, chemicals, oil refining, and pharmaceuticals industries. Key producers include Acceria Forni (at Gorla Minore), a manufacturer of superalloys; suppliers of castings and specialist parts such as Safas (Tavernelle), RA FLA VA (Milan), Fondinox (Sergnano), Feat Group (S. Maurizio d'Opaglio), Forgital (Vicenza), and Metalforch (Primaluna); and, other specialist alloy producers such as KME Group (Florence, Servavalle Scrivia, and Fornaci di Barga), and Pietro Rosa TBM (Maniago)



- Italy is an important centre for the nickel-plating industry. Metal finishing and coating services are supplied to industries such as consumer goods, commercial catering, and automotive. There are around 250 companies, the vast majority of which are SMEs. Most are concentrated in the North-Brescia region and in the Milan-Venice corridor.
- ‘First Use’ industries that are critically dependent on nickel, produce approximately Euro 1.6 billion in value-added at this stage of the value chain. Around two-thirds of this is derived from stainless steel.
- Additionally, Intermediaries (e.g. fabricators) produce a further Euro 0.9 billion in value-added.
- Employment in ‘First Use’ industries and intermediaries that are critically dependent on nickel is estimated to be 27,000 people. This includes both the people employed directly by the ‘First Use’ industries, and those employed indirectly in activities that have now been outsourced to third party suppliers.

In addition, ‘First Use’ industries created a further 11,000 jobs in the economy through income and supplier ‘multiplier’ effects, and capital expenditure effects.

2.4. End Use Applications in Italy

- There are a number of critical applications of nickel where nickel-containing alloys significantly transform either the production process or the end product that is manufactured. Moreover, in a number of these applications, this transformation cannot be achieved by any other means, or only through a substantial reduction in the performance of the product or the production process. These products are ‘critically dependent’ on nickel. They include, for example:
 - **Jet engines.** All the hot parts of the engines use nickel-containing super-alloys. In addition many of the steels used, for example, in shafts incorporate nickel to cope with elevated temperatures and to minimise corrosion. Avio Group, based in Turin, is the principal Italian-based producer of jet engines and engine components. The group has jet engine production facilities at Acerva, Pomiliano D’Arco, and Rivalta di Torino. The group has civil and defence expertise, and works as a partner with Rolls Royce, GE, and Pratt & Whitney.
 - **Industrial and marine gas turbines.** Nickel-based super alloys are essential to the successful operation of the gas turbine. Italy is an important centre for the production of gas turbines for power generation and for the chemicals, oil refining, and oil and gas production industries. Major producers include Ansaldo Energia, a subsidiary of Finmeccanica, with a factory at Genoa; MAN Turbo with production facilities at Schio; and Avio, the jet engine producer, with specialised marine gas turbine manufacturing facilities at Brindisi.



- **Process plant** equipment manufacturers (for industries such as food and drink processing, oil and gas production, petroleum refining, chemicals and pharmaceuticals) use nickel. The major usage of nickel is as an alloying element of stainless steel but, in special environments such as high temperature or corrosive environments, nickel-base alloys are applied instead of stainless steel. Italian companies are major producers in this sector, particularly in the food and drink processing segment.

Important Italian-based producers of nickel-containing pipework and other components for the oil and gas production, petrochemicals, and oil refining sectors include Marcegaglia (based in Milan and with more than 10 Italian plants, including facilities at Milan, Contino, Ravenna, Forli, and Boltiere), ATI (at Erba), AD Tubi Inossidabili (Anzano del Parco), Giemonox (Schio), Rivit (Caltrano), Satinox Tubi Inox (Vigano di Gaggiano), Siderinox (Morimondo), Sitai Inox (Prato Sesia), Tubificio di Terni (Terni), and Mannesmann DMV Stainless (Costa Volpino).

In the food processing industry, Italian companies, many of them highly-focused specialists, are amongst the global leaders in a number of segments. Moreover, a significant proportion of Italian production is exported. Producers include Promoca (at Parma), Zindo (Barletta), Sirman (Curtarolo), Risco (Thienne and Zano), Pavan (Galliera Veneta), La San Marco (Gradisca D'Isonzo), Fimar (Rimini), and Colip (Galliera).

- **Commercial catering equipment market.** The properties of stainless steel that are most valued by purchasers of commercial catering equipment include corrosion resistance, heat resistance and ease of cleaning. Ali Group, with sites in Treviso, Bolzano, Mantova, Belluna, Bologna, Vecenza, Milan, and Varese, is the largest Italian producer of commercial catering equipment, and one of the leaders in the EU. Other, smaller producers include Mam Forni (at Modena), Fage (Dosson), Eurinox (Villotta di Chioni), Arris Catering Equipment (Cadenaghe), and the restaurant division of Smeg (Guastalla).
- **Medical and dental instruments market.** These include stainless steel products such as injection needles, pincers, drills and surgical instruments, and furniture. Italian companies include Carniaflex (at Paluzza) a supplier of surgical instruments; Castellini (Bologna) a producer of dental instruments; and Eurodent (Bologna), a producer of dental furniture.
- **The CD/DVD pressing market.** Electroformed nickel is used in the production of 'stampers', which are used to manufacture of CDs and DVDs. Plated nickel is also used in the final stages of preparing the 'glass master' from which the stampers are produced. CD/DVD pressing plants in Italy include Deluxe Entertainment Services at Tribiano, Durema in Milan, Pozzoli at Inzago, and the IMS plant at Caronno Pertusella.



- These ‘nickel dependent’ markets account for around Euro 3.5 billion in value-added in Italy.
- These industries employ around 43,000 people. In addition, they create a further 17,000 jobs in the economy through income and supplier ‘multiplier’ effects.

2.5. Italy Nickel Value Chain – Overall Jobs and Wealth

Whilst the Italian nickel industry itself is relatively small, it has a significant impact on the Italian economy through its value-chain. Through its critical use in nickel-containing alloys, it has a major impact on leading Italian industries such as stainless steel. In turn, the use of nickel-containing alloys in many important products manufactured in Italy means that the impact of nickel is substantial in many end-use markets.

As a consequence, the total value-added in Italy by nickel and its value-chain is estimated to be Euro 7.8 billion.

Table 1: Value Chain Summary

	Value-Added (Euro Million)	Total Employment	Examples
Direct nickel industry/recycling	1,800	4,000	
‘First Use’	1,600	20,000	<i>Stainless Steel:</i> Acciai Speciali Terni <i>Nickel-based Non Ferrous Alloys:</i> Acceria Forni, Safas, RA FLA VA, Fondinox, Feat Group, Forgital, Metalforch, KME Group.
Intermediaries	900	18,000	Large number of distributors, fabricators, metal finishers
‘End Use’	3,500	50,000	<i>Jet Engines:</i> Avio Group <i>Gas Turbines:</i> Ansaldo Energia, MAN Turbo, Avio <i>Process Plant Equipment:</i> Marcegaglia, ATI, AD Tubi Inossidabili, Gieinox, Promoca, Zindo, Sirman, Risco, Pavan, La San Marco. <i>Commercial Catering:</i> Ali Group, Mam Forni, Fage, Eurinox, Arris. <i>Medical Instruments:</i> Carniaflex <i>CD/DVDs:</i> Deluxe Entertainment Services, Durema, Pozzoli, IMS.
Total	7,800	102,000	

Moreover, the direct nickel industry and the industries in its value chain that are critically dependent upon it, employ a substantial number of people. Total employment in Italy in the direct nickel industry, ‘First Use’ industries and intermediaries, and ‘End Use’



industries that are critically dependent on nickel is estimated to be approximately 73,000. Some 29,000 additional jobs have been created in the economy through income and supplier ‘multiplier’ effects. This represents around 102,000 jobs that are ‘critically dependent’ on nickel.

3. OTHER SOCIO-ECONOMIC BENEFITS

Nickel and nickel-based platform technologies provide a range of additional socio-economic benefits to Italy and its citizens that are often not apparent to policy-makers and the general public. Important insights into the scale and nature of these additional benefits can be obtained through an examination of the role that nickel compounds (complex chemicals based on different forms of nickel) play in underpinning the competitiveness of major industrial and service sectors in Italy (such as aerospace, automotive, oil refining, and optical media), and in supporting economic efficiency and innovation across large parts of Italy’s economy.

Nickel compounds are used in a very wide range of applications in many different industries. In many cases, they act as ingredients or raw materials, delivering important product-specific benefits, such as cost or performance. In some cases, however, nickel compounds act as enabling technologies, supporting important industrial processes. These include: the use of electro-forming to produce specialist moulds, dies, and meshes; the production of complex, modern batteries, including fuel cells; and the production of advanced nickel-based catalysts.

In turn, these processes support the competitiveness of major industrial and service sectors in Italy; deliver jobs and wealth; trigger innovation; support economic efficiency; and help Italy achieve its environmental goals.

In Italy Oil Refining industry, for example, nickel-based catalysts, through their critical role in reforming, hydrocracking, and desulphurisation, enable oil refiners to meet the needs of customers and regulators for low sulphur transport and heating fuels, whilst, at the same time, helping to minimise raw material costs by facilitating greater use of lower cost crude oils and by enhancing energy efficiency. Nickel-based catalysts also facilitate improvements in yield, and hence product prices, by supporting advanced conversion and up-grading technologies used to maximise output of lighter transport fuels.

Over time, enhanced sectoral competitiveness helps to sustain employment. In Italy the Oil Refining sector supports nearly 25,000 jobs directly and indirectly and contributes almost Euro 4.5 billion to Italy’s GDP. Major refiners include Agip (at Gela, Livorno, Marghera, Sannazero), and Taranto), ERG (Priolo and Melilli), ExxonMobil (Syracuse and S. Martino Di Trecate), Raffineria di Milazzo (Messina), and Savas (Sarroch).

Moreover, platform technologies based on nickel and nickel compounds help deliver ‘real world’ solutions to environmental challenges. Today, the use of non-metallic materials in the aerospace and automotive industry, made possible by nickel electro-forming, reduce weight, increase fuel efficiency, and cut emissions, for instance.

In the near future, SOFC fuel cell technology, based on nickel and its use in batteries, provides power generation operators with a realistic and effective way of responding to regulatory incentives to reduce greenhouse gas emissions. Alongside this, Hybrid cars



offer substantial environmental benefits: emissions of carbon dioxide and other pollutants are reduced; fuel consumption is cut; and noise levels are lower. They offer Europeans a practical technology pathway towards meeting environmental goals.

4. CONCLUSIONS

Nickel is an ‘enabling technology’, not simply an industry sector processing primary materials. Its particular properties, such as strength at high temperatures, corrosion resistance, and ductility, have helped Italian users create new products and industries, to develop new user benefits, and to deliver enhanced performance in a wide range of advanced manufacturing sectors.

Whilst Italy direct nickel industry itself is relatively small, it has a significant impact on Italy economy through its value chain.

Based on applications that are critically dependent on nickel, the total value-added by Italy nickel industry and its value chain is estimated to be over Euro 7.8 billion.

The nickel value chain also supports large numbers of jobs in Italy, estimated to be in the order of 102,000. Many of these jobs are well-paid and highly skilled, and are often in manufacturing industries that are globally competitive suppliers of capital goods.

Indeed, Italy is a global leader in a number of capital goods industries that are critically dependent upon nickel technology. Advanced ‘End Use’ manufacturing sectors in Italy that are critically dependent on nickel include the manufacture of jet engines and gas turbines, the production of process plant equipment used in important industries such as food and drink, oil, chemicals, and pharmaceutical production, and commercial catering equipment.

However, the socio-economic contribution of nickel and nickel-based platform technologies to Italy and its citizens also includes additional benefits that are often not apparent to policy-makers and the general public.

Nickel compounds, for instance, play an important role in underpinning the competitiveness of major industrial and service sectors in Italy (such as aerospace, automotive parts, oil refining, and optical media), in supporting economic efficiency and innovation across large parts of Italy’s economy, and in helping Italy achieve its environmental goals.

