For many observers of the economic scene, Europe is a by-word for stagnation and decay. It is therefore heartening to be able to redress the balance by pointing to a part of Europe that has escaped the worst of Europe’s economic and debt problems. This article looks at four Nordic countries that epitomize this other, successful Europe – Sweden, Denmark, Norway and Finland – in order to find out how stainless steel and special alloys are produced, fabricated and consumed there.

By James Chater

Overview
The four countries examined in this survey have much in common. They are demographically small (which often correlates with efficiency and resourcefulness: compare with Switzerland or Singapore), expensive, socially liberal, egalitarian yet prosperous and avidly pro-free market. Some of them underwent crises and had to reform their economies early on. For instance, the Swedish economy hit the skids in the 1980s, but after it cut its high public spending, things improved. These reforms have allowed these countries to weather recent financial storms relatively well.

All the countries have economies which are healthily diversified; all are strong exporters. In addition, Sweden and Norway are richly endowed with natural resources: oil and gas in the case of Norway, timber, hydro power and iron ore in the case of Sweden. Finland’s forests have enabled it to become a leader in energy from biomass.

Engineering
Most importantly, where stainless steel is concerned, the region boasts a strong engineering sector, with emphasis on the marine and offshore industries. Aker Solutions, Det Norske Veritas, Douvre, Scana and Welltec specialize in oil and gas services; Alfa Laval, APV, Tranter and TTC Norge provide heat exchangers and other equipment used in process and maritime industries; Outotec offers mining and minerals processing expertise; Vestas supplies many of the wind turbines installed in the North Sea and elsewhere; Wärtsilä provides the propulsion for a good share of the world’s ships and also serves the power generation industry.
Kongsberg is active in the oil and gas, marine, aerospace and defence sectors; Metso specializes in mining, oil and gas, paper and pulp etc.; Andritz Oy (part of an Austrian firm) supplies the paper & pulp and biomass industries; and Maersk builds tankers and offshore drilling installations. All these companies are active world-wide.

Did you know?
Finland is not, strictly speaking, part of Scandinavia as its people are ethnically Slav rather than Germanic, and their language has different roots. Finland has increased its exports to Russia by 143% in the last decade, as Europe’s economy has weakened. Vattenfall, the Swedish utility company, derives its name from the Swedish word for “waterfall”. Its original name meant “Royal Waterfall Board”. The World Bank ranks Denmark as the easiest place in Europe to do business. Before World War II, heavy water was manufactured at Vemork in Norway. During the war, the plant was destroyed in a series of raids and acts of sabotage to prevent the occupying Nazis using the plant to produce nuclear weapons.

Oil and gas
The energy sector is dominated by Norway’s large oil and gas reserves, found in the North Sea, the Norwegian Sea and the Barents Sea. As of 2011, Norway is the third-largest gas exporter of refined oil. The national hydrocarbons company, Statoil is active all over the globe, and collaborates with companies like ConocoPhilips, Eni, ExxonMobil, Gazprom, Shell and Total. The stated-owned Gassco operates a number of gas pipelines to France, Belgium, Germany, Scotland and England. Additions to this network will include three new gas pipelines, the Baltic Gas Interconnector (submarine connection between Germany, Denmark and Sweden), the Baltic pipe (Norway to Poland via Denmark) and the Balticconnector (Finland to Estonia). Norway also has one LNG export facility, one methanol refinery and two oil refineries.

Denmark also has considerable oil reserves, and expects to be self-sufficient by 2015. Finland and Sweden are less well endowed, though Finland’s Neste Oil is an important refiner of petrol, diesel and biofuels. Recently it completed a new hydrocracking line for converting heavy residues into diesel at its Porvoo refinery.

Biofuels are an important priority in this region. Sweden has the largest ethanol bus fleet in the world, several municipalities derive biogas from sewage, while carmakers offer E85 ethanol-powered vehicles. Denmark’s Novozymes is among a handful of international companies that converts enzymes into cellulosic ethanol.

Statoil calling...
Norway’s leading petroleum is on the lookout for innovative ideas. At http://innovate.statoil.com the company posts challenges to which it invites people to propose solutions. At the moment, it seeks ideas about how to reduce noise. If you want to know how to become a Statoil supplier, this is explained at: www.statoil.com/en/ouroperations/procurement/howtobecomesupplier/pages/default.aspx

Power generation
The countries under discussion have very different power generation profiles. Norway derives 97% of its electricity from hydro. In Sweden, power is generated in equal quantities by hydro and by nuclear power, while renewable energy as a whole stands at a remarkable 48% (2012). In Denmark, 48% of electricity comes from coal and 25-28% from wind turbines. In Finland the two main sources are nuclear (26%) and hydro (20%).

Sweden has ten nuclear reactors in operation, of which the largest is Ringhals, with four reactors, one BWR, three PRW. Finland has four reactors, is building a fifth and has approved permits for two more. Currently Areva is building a third reactor at Finland’s Olkiluoto plant, the world’s first EPR. Finland is a leader in biomass energy (20% of primary energy consumption), thanks to its abundant coniferous forest. In March 2013 the world’s largest biomass gasification plant, built by Metso, was opened in Vaasa. A plant that will turn waste, coal and biomass into power is to be built at Naantali in the south. Denmark is a major exporter of wind power technology, which already accounts for 30% of its electricity consumption. In 2011 Denmark wants to be fully independent of fossil fuels by 2050, and it targets 80% wind power in the electricity system by 2020. Already the electricity grids of Norway and the Netherlands are connected, as are those of Germany and Sweden. Projects are under way to connect the grids of Norway to Britain and Germany.

Other industries
Pulp and paper has traditionally been strong in Finland, although its importance has waned over time. Major manufacturers include Stora Enso (the world’s largest), UPMM-real and Myllykoski. Another leader is Swedish CellULOse Company (SCA), which makes personal care products such as tissues. A relative newcomer is Munksjö, a group formed in 2012. It manufactures specialty papers used in customer design and manufacturing processes. Other important industries include diary (Denmark’s Arla is Scandinavia’s largest producer), shipping (offshore vessels, tankers, ferries); and aerospace/defence (SAAB, the former owner of SAAB automobiles).

Stainless steel suppliers
As in the rest of Europe, suppliers in the Nordic countries have been affected by overcapacity problems and the challenge of cheap Asian imports. The companies that are doing well are those that have specialized in high-end products and skills. This is pre-eminently the case with Sandvik Materials Technology, a division within the Sandvik Group. In 2013 profits increased thanks to a series of measures...
designed to adapt to challenging global conditions. The division offers the full range stainless steel (including titanium) products and services, supported by strong R&D activities and a steady stream of innovative products and processes. The company has developed a number of advanced duplex grades to meet the severest conditions in energy and process industries. These

include super duplex SAF 2807™ and hyper duplex SAF 2707 HD and, more recently, SAF 3207 HD hyper duplex, which is suitable for offshore umbilicals where extra resistance to corrosion and pressure are required. The company’s high-alloy tubes are used in heat exchangers in reactors round the world, and its products are found in a whole range of industries, from medical to severe applications in the offshore, petrochemicals and urea production industries. Transport also benefits from Sandvik’s products: among latest achievements is a yacht made entirely from super duplex SAF 2507™, and an award from Automotive Engineering International for Pressurfact™, a seamless stainless tube used in auto fuel injection systems. The company is also blazing a trail in hot isostatic pressing, which uses powder metallurgy to create near-net shapes, improving material integrity while saving raw materials costs.

If Sandvik owes much of its success to super duplex grades, Outokumpu has staked much of its success on the development of its lean duplex grades. Originally a copper mining company, Outokumpu has reinvented itself as a stainless steel company offering a wide array of products and grades. Like Sandvik it has had to adapt quickly to changing global conditions, reducing capacity at certain sites while investing in others. It took over the activities of Inoxum (spun off from ThyssenKrupp) at the end of 2012. It has invested heavily to obtain a global presence, for instance by opening a cold-rolling mill in Shanghai in partnership with Baosteel.

*Sandvik Nanoflex® is a precipitation hardening, austenitic stainless steel from Sandvik Materials Technology offering a combination of high strength and hardness with exceptional formability.*

*Wine tanks for Chalvignac, France, made of stainless steel supplied by Outokumpu.*

*Outokumpu’s new ferrochrome works in Tornio, Finland, June 2013.*
Much of Outokumpu’s success has been staked on its advocacy of lean duplex grades as an alternative to mild austenitic grades in certain applications. Its lean duplex grade LDX 2101® offers a superior strength-to-weight ratio that can be very beneficial in load-bearing applications, especially in architecture, storage tanks or silos. An added advantage is the reduced consumption of alloying materials such as nickel, which can be expensive. LDX 2101® was used in a pedestrian and cycling bridge being built in Sölvesborg, Sweden, and in storage tanks built by Japrotek for process industries. More recently, Outokumpu launched another lean duplex grade, LDX 2404®, suitable for bridges, tanks, rail tankers, floodgates and silos for the paper industry. This grade was first used in tanks used in biogas production.

Outokumpu supplies an extremely broad range of industries, including all the process industries, power generation, ships and solar energy. Recent projects include the façade for China’s highest skyscraper, Birmingham New Street Station, UK, and a natural gas field in Oman.

TPF
Manufacturers of tube, pipes and fittings include Stalatube, Quickflange and Nordic Flanges. Stalatube aims to meet increasing demand for stainless steel hollow sections in load bearing structures, which it offers in a wide range of austenitic and duplex grades. Recent applications include oil and gas, shipbuilding, wind power, food and drink, heavy transport and water treatment. In 2009 it delivered hollow sections made of 2101® to Tampere Energy Production for a bridge and dam renovation project.

Titanium
Titanium is increasingly important for Norway, which is aiming to take advantages of its abundant deposits. Norsk Titanium is developing an advanced technology, Direct Metal Deposition, a process similar to 3D printing that uses titanium wire to produce near-net shapes, thereby saving on material consumption and energy costs. It is working with Spirit AeroSystems on improving ways to manufacture complex aircraft components. The titanium industry is also represented by Permascand, VSMPO Titan Scandinavia and Aerotitanium.

Other specialities
The Nordic countries contain specialists in welding consumables and equipment. Avesta Welding, now part of the Böhler-Uddeholm Group, manufactures covered electrodes, flux cored wires and solid wires. Fagersta Stainless offers rod and wire used in fasteners, springs, welding wire and electrodes, cycle spokes, building and household applications. ESAB is an established supplier of advanced welding equipment. Powder technology is another widely offered skill: apart from the companies already mentioned, Carpenter Powder Products, Erasteel Kloster and Metec may also be mentioned. Finally, the region contains several stockholders – for instance Cronisteel, Da Capo, Harald Pihl, Nordic Pipe, Norwegian Piping PM Norway, Scandinox, Sverdup Steel – in addition to several valve and pump suppliers.