NICKEL

Finland's "designer for the environment"

India's biogas carbon offset projects

MARCH 2008 VOLUME 23, NUMBER 2 THE MAGAZINE DEVOTED TO NICKEL AND ITS APPLICATIONS

'GREENER' AIR TRAVEL

NICKEL MOULDS HELP LIGHTEN THE LOAD

Nickel

Making Your Life Better

Ni

HYGIENIC

The next time you pour yourself or your kids a glass of milk, consider how pure and safe it is to drink. That's because nickel-containing stainless steels are used in all of the processing and transportation equipment that's needed to bring milk from the dairy cow to your milk carton. That enables you to live a healthier life. Nickel-containing stainless steels are the material of choice for a wide range of food processing industries because it is hygienic and results in less spoilage of food.

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NICKEL

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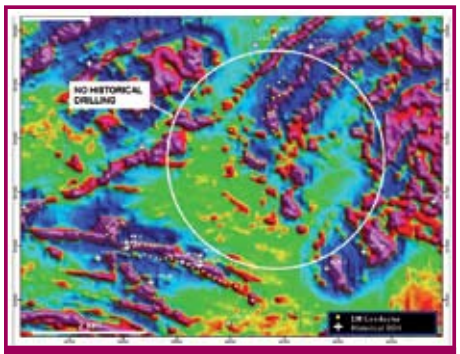
Cover:
Boeing's new Dreamliner aircraft due to take flight in 2009.

The next issue of Nickel Magazine will be published in June 2008.

FINDING MORE NICKEL

WORLDWIDE DEMAND FOR NICKEL HIT A RECORD 1.4 MILLION TONNES IN 2007. THE MAIN DRIVER WAS THE BOOMING ECONOMY IN CHINA, WHICH ACCOUNTED for 22% of nickel demand, compared with 11% four years ago.

Nickel contributes to sustainable development in vital ways — through water purification and distribution systems, air pollution abatement hardware, and renewable energy infrastructure — so it's little wonder demand for the "enviro-metal" is at an all-time high.



Electromagnetic anomalies become drill targets for nickel deposits.

INTERNATIONAL NICKEL VENTURES

In this issue of Nickel Magazine we report on the increasing number of Clean Development Mechanism (CDM) projects that use turbines made of high-temperature nickel alloys. Such projects are springing up not only in China but in India, Brazil and other developing countries (see page 4).

CDM projects may not be a huge market for nickel, but it is a growing one, and they're a reminder of how nickel supports sustainable development.

More nickel was recycled in 2007 than in many previous years; nonetheless, supply still cannot keep pace with demand. The question then becomes: Can enough minable deposits of this valuable natural resource be discovered to meet demand? Or, more simply, is nickel a sustainable resource?

Judging from the number of junior companies exploring for the metal in Canada alone, the answer is yes. Most, if not all, of these companies were busy promoting their various projects to investors at the 2008 convention of the Prospectors and Developers' Association of Canada, held recently in Toronto.

• International Nickel Ventures Inc. is drilling electromagnetic anomalies and coincident magnetic highs in the James Bay Lowlands of northern Ontario. As well, the company is completing geophysical surveys on a property adjacent to, and on the same geological trend as, Xstrata Nickel's Montcalm mine, near Timmins, Ontario.

• Fletcher Nickel Inc. is drilling geophysical targets elsewhere in the Timmins district.

• Independent Nickel Inc. is re-examining former nickel producing properties at Lynn Lake in northern Manitoba in an attempt to expand mineral resources there.

• In the Sudbury area of northern Ontario, First Nickel Inc. is expanding the resource base at its Lockerby mine and expects to add 8-10 years to the operation's lifespan. Meanwhile, production has commenced at First Nickel's Premiere Ridge mine, not far from Xstrata Nickel's Strathcona mill complex. First Nickel also manages two promising exploration projects in the Sudbury Basin.

The Precambrian Shield, which covers nearly half of Canada, clearly holds a good deal of untapped potential for the discovery of sizable nickel deposits, and exploration companies are awash in the cash needed to find and develop them.

Sadly, the last major nickel deposit discovered in Canada, Voisey's Bay, in Labrador, took 10 years to reach production. But mineral exploration companies are striving to shorten lead times. Canadian Royalties Inc., for example, is negotiating impact and benefit agreements with native groups in an attempt to move its Nunavik nickel project toward production. The mine is only 20 km south of Xstrata Nickel's Raglan mine in northern Quebec, and the cost of achieving production is estimated at $225 million, Canadian Royalties says.

In addition, the PDAC and Canadian native groups have signed a memorandum of understanding aimed at fostering the co-operation needed to turn discoveries into producing mines.

All of which underscores the value of nickel as a sustainable resource.

Patrick Whiteway

Patrick Whiteway
Editor

NICKEL IN USE

©ISTOCKPHOTO.COM/ZORAN KOLUNDZIJA

Creating Carbon Offsets

Gas turbines turn biogas into electricity

Many airlines offer their customers a way to offset greenhouse gases produced by their f ight. These so-called "carbon offsets" are small donations which are ultimately used to finance projects that will help reduce greenhouse gases in the world by an equivalent amount.

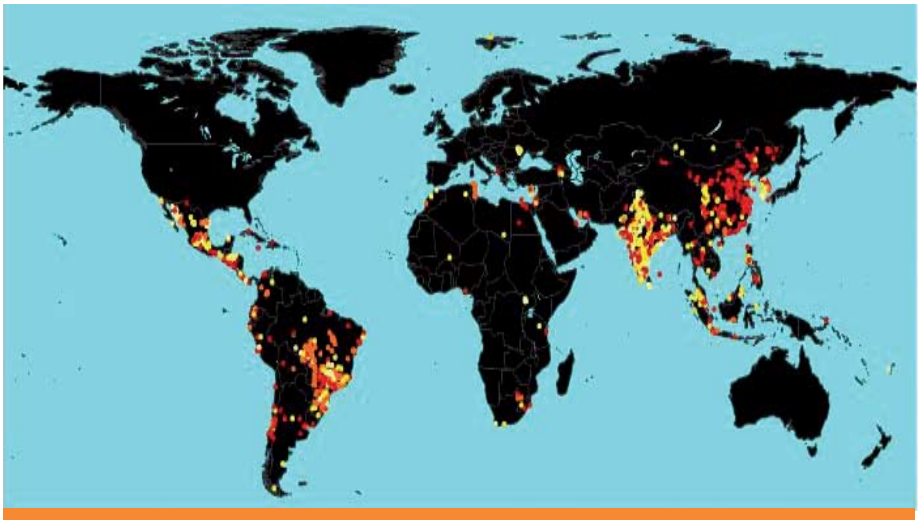
Virgin Atlantic Airways Ltd., for example, supports two projects with the money donated by customers. One is the reconstruction of a hydroelectric plant in Indonesia; the other, a project in India that generates electricity from biomass, such as sugarcane husks.

In fact, many of the small biogas projects registered by the Clean Development Mechanism (CDM) in India burn renewable, alternative fuels in gas turbines to generate electricity. These turbines require nickel alloys for their efficient operation.

The CDM, which is an arrangement under the Kyoto Protocol allowing industrialized countries with a greenhouse gas reduction commitment to invest in projects that reduce emissions in developing countries, has 935 registered projects, most of which are energy-related. Well over a third of all CDM's projects are in India (more than in any other country).

Among the manufacturers of gas turbines used in these biogas projects is Capstone Turbine Corporation of Chatsworth, California, U.S.A. It manufactures four sizes of turbines that generate 30, 60, 65 and 200 kilowatts.

Nickel alloys are a critical enabler of turbine technology, providing strength and corrosion resistance at high operating temperatures. For example, nickel alloy N06002 is used in the combustion chamber of Capstone's generators where corrosive gases burn at temperatures as high as 870° C. The spinning turbine is made of N07713, and the main rotor shaft is fabricated from N07718. The recuperator housing, which recycles hot gases to the combustion chamber, is made of austenitic stainless steels S30100 and S34700. Other components made from nickel-containing alloys include the rotor, turbine nozzle, recuperator, thrust shaft, heat shields and fuel injectors.



Location of large and small Clean Development Mechanism projects worldwide

Legend
- • = CDM project Large scale, one location
- • = CDM project Large scale, several locations
- • = CDM project Small scale, one location
- • = CDM project Small scale, several locations

India's extensive Clean Development Mechanism projects

India's participation in energy projects that reduce greenhouse gas emissions is a major development: According to the United States Agency for International Development, the country is the world's fifth-largest (and second-fastest-growing) producer of greenhouse gases, and its power sector is the largest single contributor. USAID is helping India reduce its emissions with clean energy technologies and best practices. In 2003, the agency reported that biogas projects, along with

CLEAN DEVELOPMENT MECHANISM

other energy programs, helped prevent the production of 11.3 million tons of carbon dioxide. (Biogas is a mixture of methane and carbon dioxide produced by the bacterial degradation of organic matter and used as a fuel.)

Corporations in countries with emission targets can also buy carbon offsets from countries that earn them by implementing projects that cut greenhouse gas emissions. The CDM, under the guidance of the Conference of the Parties of the United Nations Framework Convention on Climate Change, evaluates and registers projects that reduce greenhouse gas emissions. The carbon offsets, or credits, are awarded for sale to countries to apply against their emissions targets.

As more projects are built to generate electricity from alternative fuel sources using gas turbines, fewer conventional power sources will be required, reducing global greenhouse gases.

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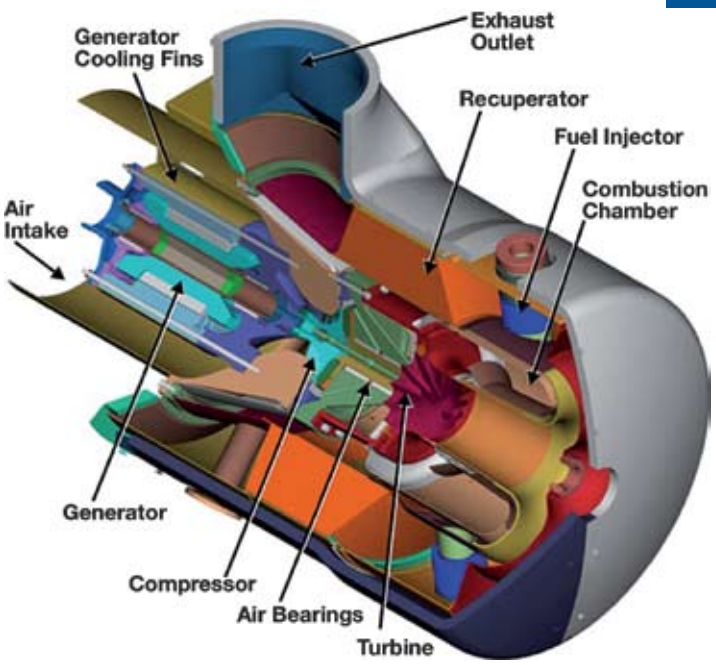
CAPSTONE TURBINE CORPORATION

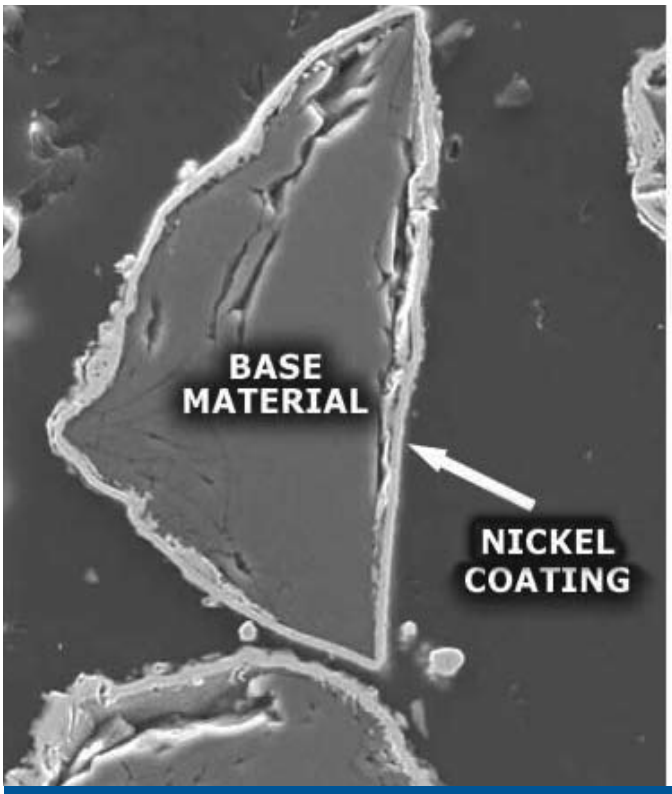


Nickel alloys are essential to turbine technology providing strength and corrosion resistance at high operating temperatures

MORE INFORMATION:
www.nickelmagazine.org/carbonoffset

Coating Nano-Powders with Nickel

Many applications rely on fast, uniform coatings



1000 times magnification of 100% nickel coated powder

WEBER MANUFACTURING TECHNOLOGIES INC.

Weber Manufacturing Technologies Inc., of Midland, Ontario, Canada, is using its nickel vapour deposition (NVD) process to apply uniform coatings of nickel to powders. Nano-particles as small as tens of microns can be coated, and the coating thickness can be controlled over a broad range (10-80% by weight, for example).

Nickel-coated powders are used in electromagnetic interference shielding for electronics, in nickel-coated abrasives and cutting tools, and in thermal arc spray coatings.

NVD turns nickel powder and carbon monoxide into nickel carbonyl gas. In the powder coater, the gas converts back to nickel on contact with the substrate material at temperatures ranging from 130 to 170ºC. The carbon monoxide is returned to the system for reuse.

"We can coat a lot of different powders easily and in large quantities," says Alan Horst, manager of Weber's NVD plant.

The company has test-coated aluminum and graphite powders. Its research and development coater can coat 30 kilograms of substrate with six kilograms of nickel in three hours. A full-scale production unit will be able to coat about 150 kg of substrate in the same time. Since this plant is capable of preparing 150,000 kg of nickel a year, the company could easily bring additional powder coaters on stream as demand increases.

In addition to achieving uniform coatings, the NVD process is about 20 times faster than electroplating. Also, there is no need for drying afterwards: the powder is ready for use immediately after the coating.

MORE INFORMATION:
www.nickelmagazine.org/coatings

Extending the Life of Japanese Apartments

An 'all-stainless-steel' piping system aims to extend the life of residential high-rises

The Japanese Stainless Steel Association (JSSA) has entered into a 3-year program designed to expand the use of long-lasting nickel-containing stainless steel in residential high-rise piping systems throughout the country.

The advantage of the all-stainless-steel piping system as it's called, is that the plumbing systems in high-rise buildings will last longer and require fewer repairs, thanks to the durability and corrosion-resistance of stainless steel.

Both the Nickel Institute and the Japan Valve Manufacturers' Association are participants in the government-subsidized project, which focuses on water supply and drainage pipes, as well as fire-fighting equipment, in collective housing.

JSSA proposed this program in response to a report tabled in May 2007 by the Housing and Land Investigation Committee of the then-governing Liberal Democratic Party of Japan.

According to the report, titled 200-Year Housing Vision, the average apartment building in Japan lasts only 30 years, compared with 55 years for American homes and 77 for English ones. The short lifespan is an economic burden for residents as well as a hindrance to conservation efforts.

The report urges the housing industry to adopt, as its goal, an average lifespan for all housing of 200 years. Future high-rises will be characterized by energy conservation, harmony with the surrounding environment, earthquake resistance, and regular and easy maintenance.

Most Japanese housing is multi-unit, consisting of both shared and private spaces. The report suggests that piping systems in shared areas be considered part of the whole "skeleton" of the residential structure. This concept uses stainless steel valves, because of their durability, which reduces the need for repairs and expanding the life of the entire piping system.

Another advantage to longer-lasting housing will be a reduction in carbon dioxide emissions. Dismantling and rebuilding structures call for the production and transportation of pipes, valves and other materials, which in turn causes carbon dioxide emissions. The shift toward durable piping, and away from continuous replacement, will inevitably create a reduction in those emissions, as well as in overall energy consumption.

These and other benefits show how the country's 200-Year Housing project is in keeping with the Japan Stainless Steel Association's goal of developing demand for stainless steel products while contributing to environmental sustainability.

MORE INFORMATION:
www.nickelmagazine.org/apartments

A new concept for Japanese high-rises

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Stainless steel plumbing reduces maintenance

JAPANESE STAINLESS STEEL ASSOCIATION

Aiming for an average lifespan of 200 years

URBAN RENAISSANCE AGENCY

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Controlling Floods Along the Mississippi

Stainless steel wire embedded in concrete helps control erosion, improve navigation

The Lower Mississippi River snakes its way in a continuous series of meandering curves from its confuence with the Ohio River southward for about 1,600 kilometres to New Orleans, after which it empties into the Gulf of Mexico.

Erosion has to be controlled along the curving concave banks of the river to prevent fooding. Toward this end, the Mississippi Valley Division of the U.S. Army Corps of Engineers manages a "Channel Improvement" program as part of the federal Mississippi River and Tributaries Project.

The work entails taking large rectangular slabs of concrete and piling and laying them side by side. Each slab is 7.6 metres (m) long, 1.2 m wide and 80 millimetres (mm) thick and consists of 16 squares of concrete. The squares are cast through a rectangular mesh of S24100 stainless steel reinforcing wires (containing 2% nickel) about 38 mm in diameter. S24100 was chosen for its strength and wear resistance. The wires are embedded in the concrete, with looped ends poking out of the edges of the slabs.

Holding the slabs together are copper-coated steel connector wires about 300 mm long, that are twisted around the looped ends of the stainless wires. In this manner, the squares, which weigh about 1.6 tonnes apiece, are strongly connected yet fexible.

Thirty five such squares are connected side to side to form an array 43 m wide and 7.6 m long on the sloped launching deck of a river barge aligned parallel to the riverbank.

Steel launching cables roughly 12 mm in diameter are connected between each square to control the launching of the slabs off the barge on to the riverbank and thence underwater to depths of up to 30 m or possibly more, as required.

As the end of the first 7.6-m-long array nears the launching deck, a second array is connected end-to-end from a supply barge beside the launching barge, forming an elongated, fexible "mattress." This process continues until the mattress is lowered to the required depth.

Since the mattress is fexible, it can conform to irregularities in the riverbank both above and below the waterline. Each mattress is held in place by anchors driven into the riverbank near the waterline. The accompanying illustrations show how the ingenious process works.

Protection of the Mississippi's riverbank has been ongoing since the late 1800s, though the use of concrete slabs didn't begin until the time of First World War, and stainless steel didn't enter the picture until the mid-1970s. By now, pretty well every erosion-prone concave bank has been protected over the entire length of the river. Every placement is checked regularly, and repaired if damaged.

"The refined design we are using on the Lower Mississippi is tried and proven, cost-effective, and altogether an excellent product," says Steve Ellis, a civil engineer and consultant to the Army Corps on the Channel Improvement program.

The excellence derives largely from the use of stainless steel in the metal mesh fabric that connects the concrete slabs together, to minimize the erosion of the riverbanks.

MORE INFORMATION:
www.nickelmagazine.org/mississippi

U.S. CORPS OF ENGINEERS

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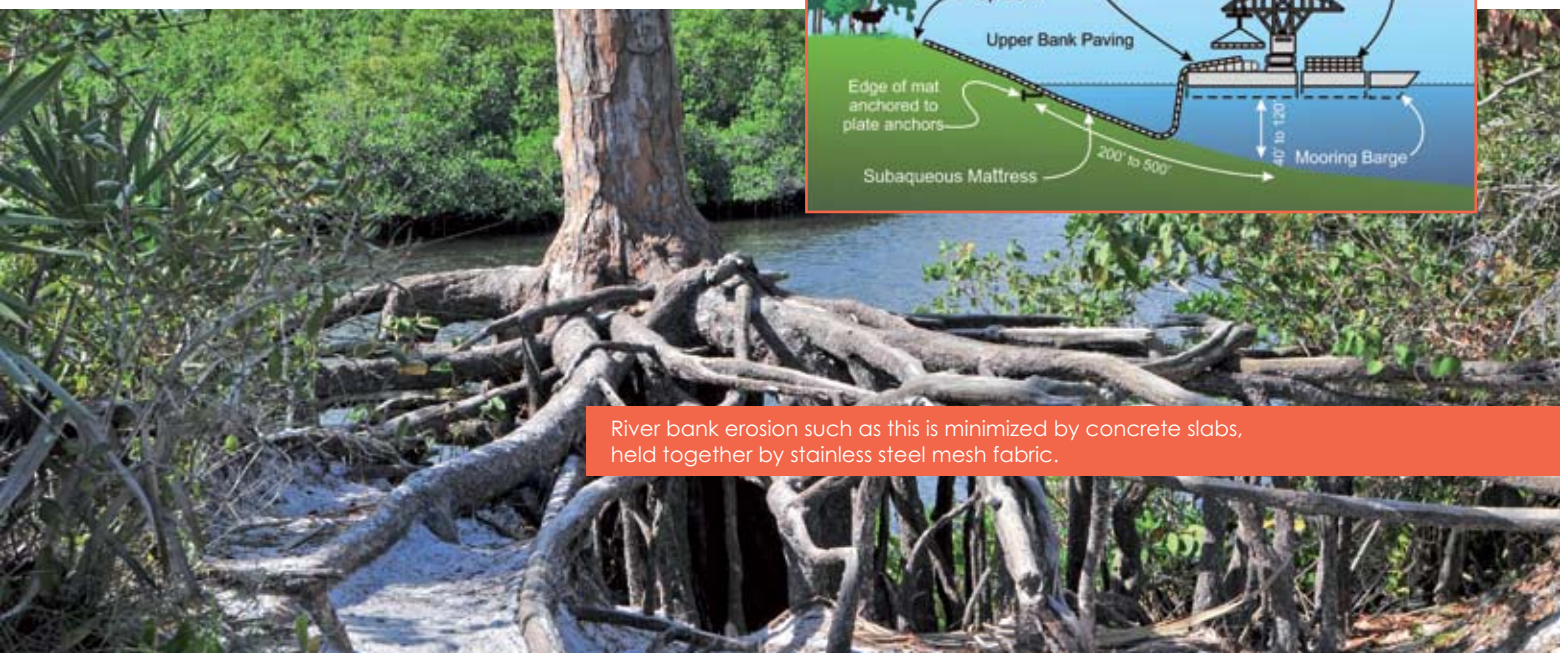

River bank erosion such as this is minimized by concrete slabs, held together by stainless steel mesh fabric.

Light FLIGHT

How Nickel Contributes to More Sustainable Air Transportation

Airlines are constantly striving to burn less fuel. Doing so both reduces costs (fuel consumption accounted for 26% of airlines' operating expenses globally in 2006) and lessens the impact of air travel on the environment (the industry remains a major emitter of nitrous oxide and carbon dioxide).

In response, aircraft manufacturers are building more fuel-efficient planes. Fast and flash designs, such as the Sonic Cruiser concept The Boeing Company unveiled in 2001 and dropped just a year later, are being replaced by aircraft that are slower but more economical. There will likely never be another Concorde.

The fuel efficiency of aircraft designs has improved by 70% in the past 40 years, and 20% of those improvements were achieved in the past decade. Since the 1960s, carbon monoxide levels have dropped by 50%, and unburned hydrocarbons and smoke, by around 90%. The International Air Transport Association (IATA) reports that, by 2020, nitrogen oxide emissions could be reduced by 80% and fuel efficiency improved by 25% — all as a result of investing in new aircraft. Combined, these improvements should eliminate 345 million tonnes of carbon dioxide emissions during the next 13 years.

Aircraft manufacturers have increased fuel efficiency by improving aerodynamics, particularly in the area of winglets, those vertical appendages at the ends of wings that, among other things, reduce drag. Better engine design has also played a role, an example being the use of higher-temperature nickel alloys to raise operating temperatures.

But the most striking gains are being made by lowering the weight of airframes. This is achieved by replacing aluminum with ever-increasing amounts of composite materials: layers of carbon fibre and other types of cloth, impregnated with epoxy resin. Three aircraft illustrate the trend:

When the Boeing 777 first flew in 1994, it was

©ISTOCKPHOTO.COM/JOE SACHER

THE BOEING COMPANY

1 Wing assembly: Nickel makes the use of light composites possible

2 Nickel moulds enable composite use by aircraft manufacturers

3 Mould containing composite cowling

4 The assembly floor at Boeing aircraft

5 General Electric GEnx engine with composite fan blades

9% composite by weight (another source cites 12%). Composites accounted for about 23% of the airframe weight of the Airbus A-380, which made its maiden flight in 2005. Boeing has pushed that to 50% for its newest commercial airplane, the 787, also known as the Dreamliner, which will make its maiden flight in 2009.

The Dreamliner is the first commercial airplane with an airframe completely made of carbon fibre composites rather than aluminum. Such a high percentage of composites, coupled with improved engine design and aerodynamics, will make the Dreamliner 20% more fuel efficient than the B-767 or Airbus A330, according to Boeing.

Composite construction depends on a 36% nickel alloy called Invar, developed by Charles-Édouard Guillame (1861-1938) in the late 19th century. Its most important property, a near-zero coefficient of thermal expansion, makes it the material of choice for the construction of molds, or mandrels, on which composite parts are laid up and then cured in autoclaves at temperatures as high as 375-425° Celsius. Invar's exceptional stability ensures composite parts maintain precise tolerances of just fractions of a millimetre while being cured.

Boeing is using composites for the skin of the Dreamliner (fuselage, wings and tail, and other structures such as the wing box). For example, one of the fuselage sections, which measures 6.7 metres (m) long and 5.8 m wide, is made by laying down epoxy-soaked carbon fibre tape on a rotating mandrel made from smaller, interlocking mandrels. A one-piece fuselage section eliminates 1,500 aluminum sheets and 40,000-50,000 fasteners.

The wing span of the 787-3 Dreamliner version is 52 m. The wing skins are made of composite material laid up on two different Invar mandrels, one of which is 31 m long and weighs 36 tonnes.

Altogether the use of composites means the Dreamliner weighs 4,536 kilograms less than it would have had Boeing used aluminum.

Both the A-380 and Dreamliner are super-efficient in terms of fuel consumption per passenger mile, but they also contribute to the efficient use of airports while reducing local pollution. The A-380, with 555 seats for a typical configuration and a range of 15,000 kilometres, fits the hub-and-spoke model of air transport wherein large planes fly between central airports while smaller planes ferry passengers to and from regional ones. One way to reduce the congestion and delays that plague large airports is to fly fewer planes carrying more passengers.

The Dreamliner has a range of 4,650-5,650 km for the 787-3 version, 14,200-15,200 km for the 787-8, and 14,800-15,750 km for the 787-9. It can carry as many as 290 passengers on long-haul flights and as many as 330 on shorter routes. Since the 787 is a mid-sized plane, it can reduce airport congestion by avoiding hubs.

By late January 2008, Boeing had received orders for 857 Dreamliners, making it the world's fastest-selling commercial airplane.

MORE INFORMATION:
www.nickelmagazine.org/dreamliner

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Cladding Pipe Proves Cost-Effective

Companies are increasingly using weld overlaid carbon steel components to avoid the cost of solid alloy.

The Quebec, Canada company Brospec 2001 LP., for example, recently delivered 133 sections of stainless steel weld-overlaid carbon steel pipe, tees, reducers and f anges to an acid plant. The carbon steel pieces were overlaid with a two-pass weld overlay using W30938 (39MoL) and W31637 (316L) on their inside surfaces to handle the corrosive conditions created by the presence of hydrogen sulphide.

Brospec started with a 3 millimetre (mm) thick layer of W30938, layed down circumferentially with 2.4 mm diameter f ux cored wire AWS class E309LTMoT0-3, using an open arc welding process (self-shielded Flux Cored Arc Welding).

This layer acts as a buffer layer to prevent dilution of the final weld pass with the base metal.

The final layer consisted of 3 mm of W31637, laid down with 2.4 mm diameter f ux cored wire AWS class E316LT0-3.

A total of 3,764 kilograms of W30938 welding wire and 4,000 kg of W31637 welding wire was used.

The resulting weld overlay deposit can handle the corrosivity of the process conditions and is a cost-effective way to produce 316L clad pipe.

MORE INFORMATION:
www.nickelmagazine.org/cladding

Foam that Remembers

Surprising scientific research results suggest new shape memory applications

Researchers in the U.S. claim they have come up with a less expensive, faster and more energy-efficient way to make shape memory alloys by carving out extra space between individual crystals.

The breakthrough, shared by foam experts at Northwestern University and shape memory experts at Boise State University, converts a nickel-manganese-gallium alloy into a foam that changes shape when exposed to a magnetic field, then pops back into its original form when the field is reversed.

The foam could be used to replace a complicated machine with a much simpler design using fewer parts, improve the efficacy of tiny motion control devices, or better control the emissions from combustion engines by speeding up the motion of the valves.

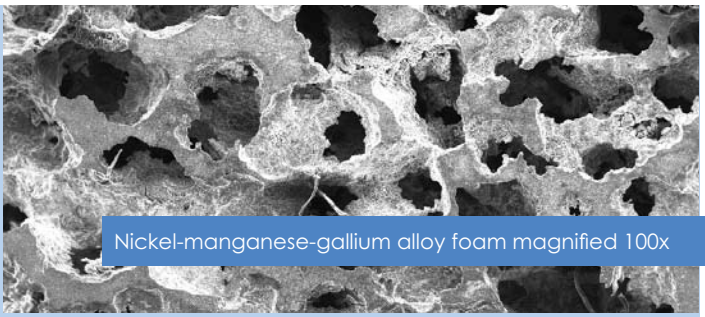
"European car manufacturers are looking into developing valves with a mechanism based on magnetic shape memory alloys," says Professor Peter Müllner of Boise State University. "In this application, the speed of action is critical."

One of the key advantages of magnetic shape memory alloys over those driven by temperature is faster response time. Another is their ability to be activated from a distance, making them potentially useful for biomedical applications: opening up an artery with a stent, for instance.

But so far, these materials have been functional only as single crystals, which are expensive and tricky to grow.

So the Northwestern-Boise team set out to create a material that approximated the excellent deformation properties of a nickel-manganese-gallium crystal, without the expense, time and energy consumption required to produce crystals individually.

To achieve this goal, Professor David Dunand and Dr. Yuttanant Boonyongmaneerat at Northwestern's Materials Science and Engineering Department poured molten nickel-manganese-gallium into a porous compact of sodium aluminate powders. Nickel constituted more than half the molten material. After the metal solidified, they leached out the oxide in acid, leaving behind large voids in the alloy.



Nickel-manganese-gallium alloy foam magnified 100x

BOISE STATE UNIVERSITY

The resulting metal foam looks like a piece of sponge toffee, allowing space for the individual crystals to move. In a typical polycrystalline metal, the crystals would stretch along different directions in the presence of a magnetic field, cancelling out each other's motion.

When Müllner and graduate student Markus Chmielus exposed the foam to a magnetic field, they found it deformed 0.12% — not nearly as much as a single crystal would but still cause for celebration since this range of deformation is sixty times greater than what had been observed in a polycrystal before.

"The results will trigger new research directions with industrial relevance," says Müllner.

The main competitor for the new metal foam is Terfenol D, another ferromagnetic alloy that was developed for military sonar devices. It converts magnetic field to mechanical power but has a maximum deformation of about 0.12%. If Dunand and Müllner could better this by tinkering with their new foam, they might provide a lighter, less expansive and more effective alternative in applications such as actuators and magneto-mechanical sensors.

MORE INFORMATION:
www.nickelmagazine.org/shapememory

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Maintaining a Competitive Edge

Nickel electroforming underpins important sectors of the EU economy

Some of the largest industries in Europe are becoming more efficient, competitive and secure as a result of nickel electroforming, a simple process that can be used in a myriad of ways.

Take aerospace, which has an annual turnover of 80 billion euros and employs almost half a million people. Manufacturers are reducing the weight and fuel consumption of airplanes, and increasing lifespan, by using lighter, stronger materials produced to precise tolerances in electroformed moulds.

Or textiles – an industry in which Europe has managed to stay competitive by guaranteeing high levels of precision and accuracy while increasing production levels.

The European Union (EU) produces nearly 15% of the world's textiles, which in turn sustains more than 2.5 million jobs, according to the Weinberg Group, a scientific and regulatory consulting firm based in Brussels, Belgium.

In the case of textiles, it isn't moulds but rotary screens that make the difference. Electroforming creates precise, finely patterned screens, which transfer intricate and colourful patterns to textiles, wallpaper and carpets.

The common denominator in both moulds and rotary screen technology is nickel. During the electroforming process, nickel or other metal in solution is electroplated onto a mandrel in order to reproduce the pattern on the mandrel's surface. Although gold, silver and copper can all be electroformed, nickel is the metal of choice because it is versatile, resists heat, corrosion and abrasion, and can be electro-deposited quickly.

Another, lesser known application of nickel electroforming is the millions of small, detailed holograms embedded in bank cards and notes. Banks rely on electroforming to create the extremely precise moulds needed to protect the integrity of transactions. The Weinberg Group says this kind of protection is increasingly important given the recent increase in identity theft.

Billions of CDs, DVDs and computer games are produced using a similar kind of precise replication technology enabled by electroforming. Roughly 20 billion CDs and DVDs are produced worldwide every year, according to the Content Delivery and Storage Association, and about 100,000 of those can be created from a single electroformed mould. In the EU, entertainment applications in this sector generate annual sales of 40 billion euros and sustain 400,000 jobs, according to the Weinberg Group.

The Weinberg report concludes that nickel electroforming supports the competitiveness of some of the largest industrial and service sectors in the EU. Thanks to ongoing improvements in efficiency, sustainability and innovation, the process also reduces resource and energy consumption.

MORE INFORMATION:
www.nickelmagazine.org/electroforming

Millions of small holograms embedded in European bank notes are produced in highly precise nickel electroformed moulds.

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CHAMPAGNE COOLER

VASE

WATER PITCHER

FIRE IRONS

CREAM PITCHER

WATER JUG

PASTRY BASKET

Creating Lasting Beauty

Eero Hyrkäs brings a clean durable aesthetic to a stark winter landscape

For designer Eero Hyrkäs, artistic inspiration comes equally from the clear, bright, unspoiled landscape of his native Lapland and the from the nickel stainless steels produced by Outokumpu in the small town of Tornio, Finland, where he lives and works.

Hyrkäs looks to the northern landscape for ideas – ideas that will reveal themselves as clean lines and elegant, reflective surfaces. These qualities typify his latest collection of high-end home products, which is called JAUR, after the word meaning "deep water" in the Sami language of Lapland. The collection includes 15 functional pieces, such as a water pitcher, a coffee pot, salad servers, a champagne cooler, and trays.

Hyrkäs and six other Finnish metal smiths make the pieces by hand, in traditional style, at the designer's Tornio shop, Arctichrome Production Oy.

There's no question the stylish designs are easy on the eyes and somehow calming.

"We try to show how a simple, clean style can be beautiful," he tells Nickel. "It's important to create pieces that will still look good after long periods of time – that are timeless.

The raw material for achieving this simple, elegant, tranquil effect is nickel stainless steel – always in plentiful supply in Tornio since Outokumpu's biggest production facilities are located there. In fact, Hyrkäs used to work for the Finnish steelmaker before finding his niche as a designer some 35 years ago. The area has a long tradition of smithing. Hyrkäs's grandfather was a blacksmith.

Hyrkäs and his team use S30400 stainless steel, which has a nickel content of 8-10.5% . "We receive it in sheets," he says. "Big bundles of them, between 0.5 and 1.5 millimetres thick. We also purchase tubes. That's all we need to start creating pieces."

The surface qualities of S30400 stimulate his imagination.

"We play around with different ways of polishing the surface. There are many possibilities, many looks we can create using stainless steel. Usually we use a satin surface, though sometimes we'll opt for a more polished, shiny look. It all depends on the product."

All the stainless steel that passes through Hyrkäs's shop is recycled. "No scrap is being dumped into landfill sites," he says. "Outokumpu uses large amounts of scrap stainless steel every day, which they remelt to make new stainless steel. We do not waste any in our operations either, all my leftover scrap is taken back to them to be recycled."

Hyrkäs uses 6,000-7,000 kilograms of stainless steel per year to produce pieces that weigh anywhere between 500 grams and 1 kilogram individually.

The work can be painstaking, but through it all Hyrkäs stays focused on stainless steel's unique potential for conveying the strength and pristine beauty of Arctic nature. Small wonder his art has such a direct and calming effect on the observer.

MORE INFORMATION:
www.nickelmagaqzine.org/hyrkas

EERO HYRKÄS

Technical Expertise Tapped

To provide first-rate advice on the appropriate use of nickel-containing materials and to promote new uses, the Nickel Institute is rebuilding its network of technical consultants. Recent appointments in North America include:


Sandy Sharp, PhD

Dr. Sandy Sharp

Dr. Sharp earned his PhD in chemistry at the University of Ottawa and also holds an M.Sc. (Eng.) degree in corrosion science and corrosion engineering from the University of London (UK) and a MA in metallurgy from Cambridge (UK). His early work showed how additions of nickel, silicon and aluminum affect oxidation rates of stainless alloys and provided a basis for selecting superheater tube materials for power stations. Dr. Sharp worked at the Pulp and Paper Research Institute of Canada between 1975 and 1978, and then joined Westvaco Corp. There, over some 29 years, he managed a group of corrosion researchers and established networks to disseminate materials information. The team's superior delivery of in-house materials and engineering services led the Materials Technology Institute to name it one of five outstanding materials engineering groups in the U.S. (the others being DuPont, Ford, Intel and Union Carbide). Dr. Sharp is a Fellow of NACE and TAPPI and was named a Fellow of MTI in 2006 for "always being a visionary, working to ensure a strong future for the process industries."

James Kelly

James Kelly gained a wealth of experience related to stainless steels and nickel alloys in high-temperature applications at Technology for Rolled Alloys of Temperance, Michigan, U.S.A., between 1974 and 2007, ending up as Director of Technology. His expertise is mainly in the heat treatment and power industries, though his knowledge of incinerators and calciners is considerable.


James Kelly

Mr. Kelly holds a B.Sc. degree in metallurgy from Lehigh University in Bethlehem, Pennsylvania. He worked for Black & Decker, The General Electric Co., ATI Allegheny Ludlum Corp. and Williams International before joining Rolled Alloys.

"Jim starts from practical experience and then tries to figure out the theoretical principles, rather than vice versa," says Gary Coates, Technical Director for the Nickel Institute. "His straightforward answers have solved thousands of challenges."

Dr. Andrew Garner

Dr. Andrew Garner of British Columbia, Canada, will advise clients of the Nickel Institute on the behaviour of nickel-containing materials in pulp and paper mills.


Andrew Garner, PhD

NICKEL INSTITUTE

Dr. Garner has 34 years' experience in the forest and engineering sectors. He graduated with a B.Sc. in metallurgy from Liverpool University in 1968, which he followed with a PhD in metallurgy from the University of British Columbia in 1974.

He spent 27 years with the Pulp and Paper Research Institute of Canada (Paprican), a not-for-profit organization, first as Head of the Corrosion Group and later as the Director of the Vancouver Laboratory.

He is a Fellow of the Institute of Materials (UK), a Fellow of the Technical Association of the Pulp and Paper Industry (TAPPI), and an active member of NACE International. As well, Dr. Garner is a member of the Association of Professional Engineers and Geoscientists of British Columbia. He received the Engineering Division Technical Award and Beloit Prize from TAPPI and the I.H. Weldon Gold Medal from the Pulp and Paper Technical Association of Canada.

Recent work has included economic analysis and cost benchmarking for mill closure decisions, analysis of transformative technologies for the forest products sector, and development of corrosion inhibitors. He has co-written 46 technical publications and portions of the American Society for Metals' Metals Handbook, and been awarded 12 patents.

MORE INFORMATION:
www.nickelmagazine.org/consultants

UNS details

Chemical compositions (in percent by weight) of the nickel-containing alloys and stainless steels mentioned in this issue of Nickel.

Alloy	Al	B	C	Cb	Co	Cr	Cu	Fe	Mn	Mo	Nb	N	Ni	P	Pb	S	Si	Sn	Tl	V	W	Zn	Zr	Other
N02201 p. 16	-	-	0.02 max	-	-	-	0.25 max	0.40 max	0.35 max	-	-	-	99.0 min	-	-	0.010 max	0.35 max	-	-	-	-	-	-	-
N06002 p. 4	-	-	0.05-0.15	-	0.5-2.5	20.5-23.0	-	17.0-20.0	1.0 max	8.0-10.0	-	-	rem	0.040 max	-	0.030 max	1.00 max	-	-	-	0.20-1.0	-	-	-
N07713 p. 4	5.5-6.5	0.005-0.015	0.08-0.20	-	-	12.0-14.0	-	2.50 max	0.25 max	3.8-5.2	1.8-2.8	-	rem	-	-	-	0.50 max	-	0.5-1.0	-	-	-	0.05-0.15	-
N07718 p. 4	0.20-0.80	0.006 max	0.08 max	-	1.00 max	17.0-21.0	0.30 max	rem	0.35 max	2.80-3.30	4.75-5.50	-	50.0-55.0	0.015 max	-	0.015 max	0.35 max	-	0.65-1.15	-	-	-	-	-
S24100 p. 7	-	-	0.15 max	-	-	16.50-19.50	-	-	11.00-14.00	-	-	0.20-0.45	0.50-2.50	0.060 max	-	0.030 max	1.00 max	-	-	-	-	-	-	-
S30100 p. 4	-	-	0.15 max	-	-	16.00-18.00	-	-	2.00 max	-	-	-	6.00-8.00	0.045 max	-	0.030 max	1.00 max	-	-	-	-	-	-	-
S30400 p. 13	-	-	0.08 max	-	-	18.00-20.00	-	-	2.00 max	-	-	-	8.00-10.50	0.045 max	-	0.030 max	1.00 max	-	-	-	-	-	-	-
S34700 p. 4	-	-	0.08 max	-	-	17.00-19.00	-	-	2.00 max	-	10xC min	-	9.00-13.00	0.045 max	-	0.030 max	1.00 max	-	-	-	-	-	-	-

COMING EVENTS

MINT DIRECTORS CONFERENCE

The 25th annual Mint Directors Conference will be held in Busan, South Korea, May 11-17, 2008. The event will be hosted by the Korea Minting and Security Printing Corporation (KOMSCO), the leading mint in Asia, and will include a tour of the company's plant in Gyeongsan. Bruce McKean, Director of Sustainability and Stewardship for the Nickel Institute, will chair the environmental session and present a paper on the nickel industry's initiatives for mints in stewardship. For more information, please see: http://mdc2008.com/

EUROPEAN NICKEL The inaugural EuroNickel Conference will take place in Moscow from April 8-9, 2008. The event, sponsored by Norilsk Nickel, will feature presentations by experts on such topics as: the global outlook for nickel; mine development projects in Russia, Kazakhstan, Turkey and Finland; individual company strategies; stainless steel market forecasts; nickel investments; and recycling. Bruce McKean, Director, Sustainability & Stewardship, for the Nickel Institute, will deliver a presentation titled "Market Access and Nickel Stewardship: Keeping the Door Open." For more information, please see: www.informa.com.au/euronickel or www.euronickel-forum.com

SUPERALLOYS IN GAS TURBINES From May 5-8, 2008, Dr. Donald Boone of BWD Turbines Ltd. (California branch) and Prof. Gerhard Fuchs of the University of Florida will hold a course in Gainesville, Florida, on superalloys for heavy-duty and aircraft-type gas turbines. The course will focus on gas turbines and the ways nickel superalloys are used in them. Basic knowledge of the metallurgy, manufacture, and mechanical and surface behaviour of critical hot-section alloys will be provided. For more information, contact BWD Turbines, Walnut Creek, California, U.S.A. Tel: 1-925-938-4780. E-mail: boone@bwdturbines.com

BATTERY CONFERENCE The 8th International Advanced Auto Battery and Ultra-capacitor Conference will be held in Tampa, Florida, U.S.A., May 14-16, 2008. Scheduled topics include: market development of hybrid electric vehicles and their batteries; Nickel Metal Hydride (NiMH) and Lithiom ion for high-voltage hybrids; battery requirements and solutions for plug-in hybrids; lead acid and ultra-capacitor solutions for low-voltage hybrids; and battery pack technology and integration for light and heavy-duty hybrids. For more information: www.advancedautobat.com/AABC/index.html

NICKEL IN CHINA China Nickel 2008 will be held May 28-29 in Shanghai. Nickel producers, first users, traders, state agencies, and market analysts are expected to attend the conference, which will focus on nickel developments in Asia. Stephen Barnett, President of the Nickel Institute, will be among the speakers. For more information: www.informa.com.au/chinanickel

DESALINATION SEMINAR Centro Inox, in collaboration with the International Molybdenum Association and the Nickel Institute, will hold an Italian language seminar titled "Stainless Steels: Corrosion-Proof Alloys for Desalination Plants" on May 21, 2008, in Milan. (The city will be the site of an international exhibition of technologies for wastewater treatment and the treatment and distribution of drinking water.) Representative of three companies will explain their experiences using stainless steel in desalination plants. For more information: eventi@centroinox.it

INDUSTRIAL HYGIENE The American Industrial Hygiene Conference and Exhibition will be held in Minneapolis, Minnesota, U.S.A., from May 31-June 5, 2008. The Nickel Institute will launch a new publication, Safe Use of Nickel in the Workplace, at the conference, which is the premier occupational health forum in North America. For more information: www.aiha.org/aihce08/default.htm

STAINLESS STEEL The 6th European Stainless Steel Conference – Science and Market will be held in Helsinki, Finland, June 9-13, 2008. The conference will explore the marketing, as well as the science, of stainless steels. It will address the specific issues and role of stainless steels in meeting the challenges of modern society, particularly in terms of sustainability. Jernkontoret, the Swedish steel producers association, is organizing the event. Sponsors include Outokumpu, Sandvik Materials Technology, ESAB Welding and Cutting, ThyssenKrupp Nirosta, ThyssenKrupp Acciai Speciali Terni, UGINE & ALZ, the Nickel Institute, IMOA, the International Chromium Development Association, and Euro Inox. Dr. Peter Cutler will deliver a keynote address: "Nickel in Stainless Steels," co-authored by and Gary Coates of the Nickel Institute and Dr. David Jenkinson, a consultant to the organization. Catherine Houska, another of the institute's consultants, will also give a keynote address titled "Stainless Steels' Sustainable Advantage in Architecture." David Jordan, another consultant to the Nickel Institute will give a talk titled "Welding Stainless Steels – Practical Responses to Regulatory Trends" and Dr. Cutler will present "Stainless Steels and the Water Industry: From Knowledge to Applications." For more information: www.stainless08.com

NICKEL AND COBALT The ALTA Nickel/Cobalt conference will be held in Perth, Western Australia, June 16-18, 2008. The annual gathering of representatives of the global nickel industry features technical sessions and an international trade exhibition. For more information: www.altamet.com.au/next_conference.htm

STAINLESS STEEL SEMINAR IN JAPAN On June 19, 2008, the Tokyo Office of the Nickel Institute, in collaboration with the Japan Stainless Steel Association, will hold a seminar on stainless steel. The event will be held in Okinawa and address such topics as: characteristics of stainless steel and its applications; technical developments in the design of stainless steel piping systems for buildings; and the corrosive effects of humidity and salt. There will be an open consultation after the presentations. For more information, please e-mail: ni_japan@nickelinstitute.org

LEGISLATIVE ASSEMBLY OF ONTARIO

Ship Ahoy

This magnificent model is believed to be a replica of a ship used by French explorer Jacques Cartier during one of his three voyages to what would become known as eastern Canada (1534, 1535-1536 and 1541-1542).

In 1927, the model was presented to the Ontario Department of Mines to commemorate its role in organizing the Second Empire Mining and Metallurgical Congress, a prestigious 2-week event that included tours of Canadian mining districts.

Today the model is on display in a public hallway in the Legislative Assembly of Ontario in Toronto, Canada.

Made of pure nickel, the model was designed and executed by Paul Hardy of Storrington, West Sussex, England, for the Mond Nickel Company, which made the donation. Apart from that, we know little.

Except that it will soon be restored, and that Amber Bondy, exhibits co-ordinator at the Legislative Assembly, is seeking information about Paul Hardy and his exquisite creation.

MORE INFORMATION:
www.nickelmagazine.org/cartier