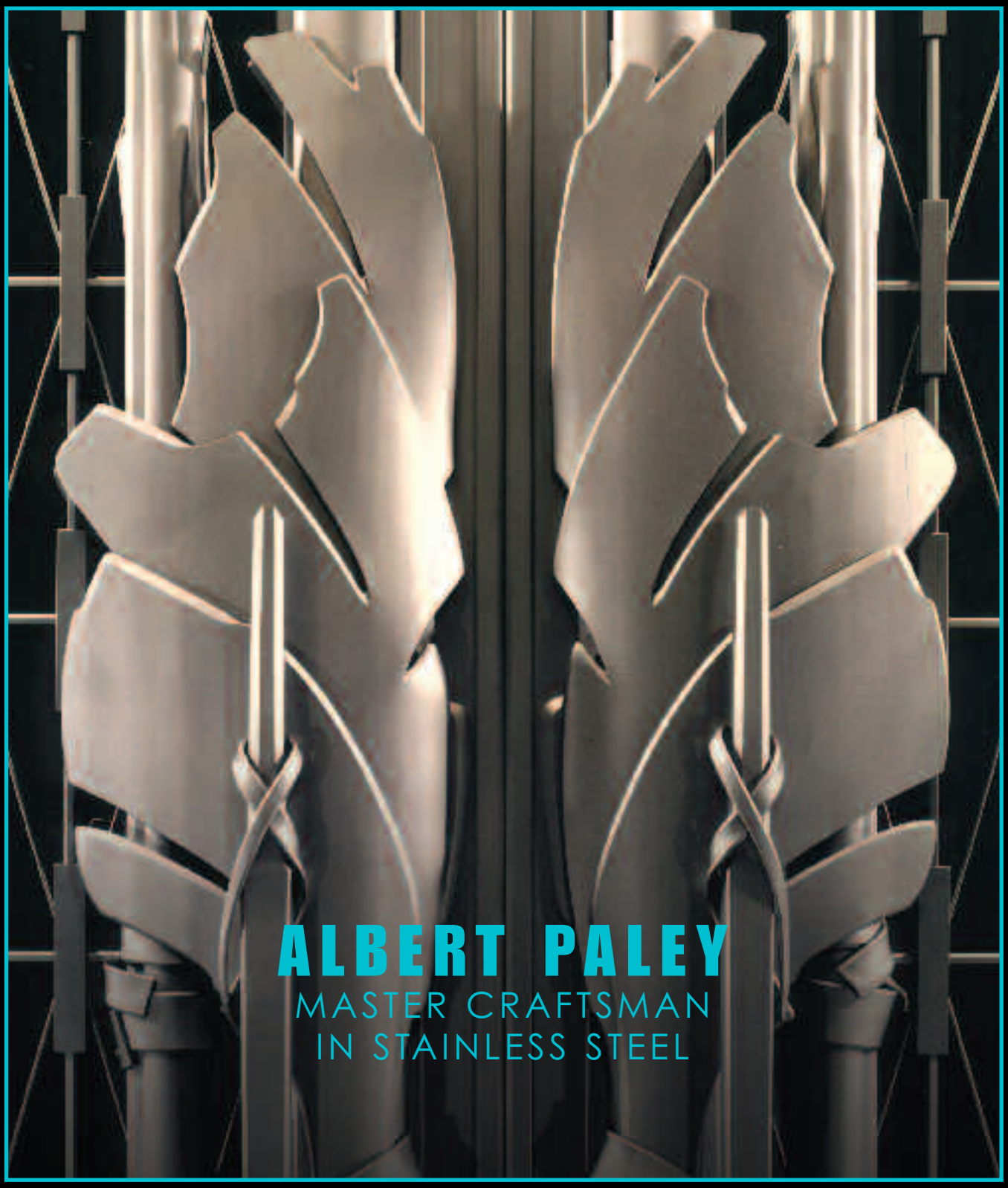
NICKEL

Special Report:
The Revival of Nuclear Power

JULY 2006 VOLUME 21, NUMBER 4 THE MAGAZINE DEVOTED TO NICKEL AND ITS APPLICATIONS



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Stainless steels are highly recyclable and typically contain 60% recycled material. Moreover, stainless steels are the materials of choice for critical applications in the production and storage of food products. Stainless steels resist colonization by bacteria, do not alter the taste of foods, and are easily cleaned and sterilized. After long service lives, stainless steels used in food production and service will be recovered, recycled and returned to service: Lasting value from stainless steel.

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NICKEL

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The Nickel Institute
55 University Avenue, Suite 1801
Toronto, Canada M5J 2H7
Tel. +1 416 591 7999
Website: www.nickelinstitute.org
E-mail: ni_toronto@nickelinstitute.org

Stephen Barnett, President
Patrick Whiteway, Editor

Circulation, 27,000 in 95 countries

Other Nickel Institute offices:

Europe
Sixth Floor
Avenue des Arts 14
Brussels 1210, Belgium
Tel. 32 2 290 3200
E-mail: euronickel@euronickel.org

European Technical Information Centre
The Holloway, Alvechurch
Birmingham, England B48 7QB
Tel. 44 1527 584777
E-mail:
ni_birmingham_uk@nickelinstitute.org

Japan
11-3, 5-chome, Shimbashi,
Minato-ku, Tokyo, Japan
Tel. 81 3 3436 7953
E-mail: ni_japan@nickelinstitute.org

Central & South America
Nucleo Inox
Av. Brig. faria Lima, 1234 Conj. 141
01451-913 São Paulo – SP, Brazil
Tel. 55 11 38130969
E-mail: nucleoinox@nucleoinox.org.br

India
K-36, 1st Floor
Hauz Khas Enclave,
New Delhi 110 016, India
Tel. 91 11 2686 5631, 2686 3389
E-mail: ni_india@nickelinstitute.org

Australasia
150 Drummond St., Suite 3
Carlton, Victoria, Australia 3053
Tel. 61 3 9650 9547
E-mail: ni_australia@nickelinstitute.org

South Korea
Olympia Building - Room 811
196-7 Jamsilbon-Dong, Songpa-Ku,
Seoul 138 229, South Korea
Tel. 82 2 419 6465
E-mail: ni_korea@nickelinstitute.org
Website: www.nidikorea.org

China
Room 677, Poly Plaza Office Building
14 Dongzhimen Nandajie
Beijing, China 100027
Tel. 86 10 6500 1188 (ext. 3677)
E-mail: ni_china@nickelinstitute.org

United States
NiPERA
2605 Meridian Parkway, Suite 200
Durham, North Carolina, U.S.A.
(Health and environment inquires only.)
Tel. +1 919 544 7722
E-mail: nipera@nipera.org

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Cover photos:
Detail of Rotunda Gate, San Francisco Court House, California, by Albert Paley (see pages 12 & 13).

The next issue of Nickel Magazine will be published in November 2006.

CHINA'S CHALLENGE

China is now the largest user of stainless steel in the world. Not only is it the largest, it also uses more stainless steel than the next two largest users: the United States and Japan, combined. With the Chinese economy growing at more than 10% per year, is it any wonder that demand for nickel, an important ingredient in most stainless steels, is expected to keep pace?

SAFE, RELIABLE nuclear fission

PHOTO: DELAVAL INTERNATIONAL

In the energy sector, nickel-containing stainless steels will be essential if China is serious about limiting its contribution to global climate change. The daunting challenge over the short term will be to limit the amount of greenhouse gases emitted into the atmosphere while meeting surging demand for electricity.

Every year the world consumes energy equivalent to about 10 billion tonnes of crude oil, according to the International Energy Agency (IEA), and 91% of that total originates from sources that emit greenhouse gases. Those emissions amount to about 23 billion tonnes worldwide.

China is already both the second-largest consumer of energy and the second-biggest emitter of greenhouse gases, behind the United States. The IEA estimates that by 2020, at present growth rates, China will likely be consuming more energy than the U.S. and its greenhouse gas emissions will have more than doubled to about 6 billion tonnes of carbon dioxide.

About 7% of the world's total energy use is currently satisfied by nuclear power, a source that emits no greenhouse gases. In China, the figure is less than 0.2%, but that is set to change. China is leading the way in the construction of new nuclear reactors.

As our special report on page 8 points out, China's National Leading Group for Nuclear Power Self-reliance Development wants installed capacity to reach 40 gigawatts (GW) by 2020, compared with 8.7 GW today. That means 30 nuclear power plants will have to be built in China by 2020, by which time the country's nuclear power industry will be generating 4% of its electricity.

If China could generate as much of its electricity using nuclear power as does France (where nuclear contributes 75%), its greenhouse gas emissions in 2020 would not be a major concern. But with abundant resources of inexpensive coal, this is not likely to happen.

Governments worldwide do need to decide how store the waste materials generated by nuclear power. James Lovelock, in his best-selling book *The Revenge of Gaia*, puts the waste challenge into perspective: if the 23 billion tonnes or so of carbon dioxide that the burning of fossil fuels emits every year were to exist in a solid form, it would constitute a mountain nearly 1.6 kilometres high and 32 km in circumference at its base. "The same quantity of energy produced from nuclear fission reactions would generate two million times less waste, and it would occupy a sixteen-metre cube," he says.

The other nuclear technology that could lead to almost unlimited amounts of inexpensive, clean electricity within 40 years is nuclear fusion (see Nickel Magazine, March 1999). A consortium of countries, including China, the U.S., the European Union, Japan, Russia and South Korea, is financing a US$ 5.5-billion, international thermonuclear experimental reactor, or ITER. The facilities are being built in Cadarache in southeastern France. If all goes according to plan, this experimental reactor will be completed by 2015, and then another demonstration reactor could produce its first electricity in 2031.

But until then, as countries such as China continue to grow economically, nuclear fission is a viable way to install a reliable and secure supply of electricity that does not contribute to global climate change.

Patrick Whiteway

Patrick Whiteway
Editor

inuse

THE LATEST NICKEL APPLICATIONS WORLDWIDE

Ready For The Big One

Japan's Numazu Harbour floodgate uses double-sided clad stainless steel

The floodgates used in Japan's many flood control and irrigation works are essential to ensuring safety, even in extreme conditions. Little wonder, then, that austenitic stainless steel is increasingly the material of choice in their construction.

Japan's largest single-diameter floodgate is found in the Numazu Harbor Waterway. The structure was built on a waterway joining the inner and outer harbours at the port city of Numazu in central Japan facing the Pacific to the south. The floodgate was built for protection against the tsunami which is expected to follow the anticipated Tokai Earthquake, if and when that disaster happens. The gate weighs 923 tonnes, is 40 metres wide and 9.3 metres tall, and strides the waterway in one span. In the event that a tsunami does occur, the gate closes to prevent water from rushing in, thereby protecting the lives of about 9,000 people, as well as some 50 hectares of land that surround the port.

The floodgate is clad in stainless on both sides. The stainless provides a high resistance to corrosion and wear, and the inner steel provides high strength at a low cost. Steel that is coated with an anti-corrosive layer was considered, but must be recoated periodically; however, stainless steel does not require recoating, which is why maintenance-free stainless steel cladding was used on both sides of the Numazu floodgate. The main advantage to using stainless is that new coatings won't have to be applied when earthquakes occur.

There are several ways of making double-sided stainless steel clad plate. The builders of the Numazu floodgate used hot rolling, whereby one side of an ordinary steel plate is overlaid with a stainless steel plate. After automatic welding of that one side in a vacuum chamber, the other side is overlaid and welded in the same way. The metal piece is then heated and rolled to allow the formation of a metallurgical bond of the different metals by diffusion. The gate piece weighs 406 tons, with the double-sided stainless steel clad plate constituting a little under half of that total. It is the first time in Japan that a floodgate, or indeed any structure, has used such a large amount of double-sided clad material.

MORE INFORMATION:
www.nickelmagazine.org/watergates

CARROLL MCCORMICK FOR NICKEL INSTITUTE

THE NUMAZU HARBOR WATERWAY FLOODGATE is the largest in Japan. It spans 40 metres from left bank to right bank and the width of the connecting bridge is 3 metres.

LARGE quantities of stainless clad steel plate were used in the structure.

IT WAS BUILT on the waterway which connects the inner and outer harbours.

Boarding Pass Please

Sleek stainless steel boarding-pass kiosks are becoming more common around the world

As the International Air Transport Association (IATA) moves toward 100 per cent electronic ticketing among its roughly 270 member airlines by 2007, boarding-pass kiosks, which allow passengers to bypass the lineups at check-in counters, are becoming more common in airports around the world.

Although kiosks proprietary to individual airlines, and usable only by their own passengers, have been spouting up in airport terminals over the past decade, the IATA has been helping airports and airlines adopt Common-Use Self-Serve (CUSS) technology, which allows passengers flying on any number of airlines to obtain boarding passes from the same kiosk.

The cost of installing and maintaining kiosks is shared among airlines. CUSS technology makes it affordable and practical to station kiosks outside the terminal (for example, in parking areas and hotel lobbies) to serve passengers of multiple airlines. Twenty-seven airports have installed nearly 600 CUSS kiosks already, and they will eventually number in the thousands throughout the world.

When the Vancouver International Airport Authority in British Columbia, Canada, decided to offer self-serve check-in, it specified a design that included S31600 trim with a brushed satin finish for the kiosk fronts. The striking result is modern and sleek, like aircraft themselves.

"We wanted a design that was consistent and iconic so passengers would have no doubt the kiosks were for airport check-in, and without a lot of supporting signage," says Kevin Molloy, the airport's vice-president of simplified passenger travel and chief information officer. There are 77 CUSS kiosks at the airport and, so far, 19 in locations outside, such as Delta and Hyatt Regency hotels and the Vancouver Tourist Information Centre.

BOARDING-PASS KIOSK commissioned by the Vancouver International Airport Authority.

IBM Canada in Markam, Ontario, manufactured the kiosks using about one square metre of S31600 in 11- and 14-gauge sheet steel for the front bezel and lower kick plates of each kiosk. "Stainless is generally a low-maintenance finish," says an IBM spokesperson. "The airport requested customization of the trim, including the front stainless bezel and the lower stainless steel kick plates."

IBM has built kiosks with stainless steel trim for many other airlines and airports, including Air Canada, British Airways, Air New Zealand and the Las Vegas and Manchester International Airports. Even the Canada Border Security Agency ordered kiosks with stainless steel trim and accents, for its Iris Recognition Biometric Trusted Traveller Program.

MORE INFORMATION:
www.nickelmagazine.org/boardingpass

Searching For New Planets

Nickel-titanium shape memory alloy could allow astronomers to build larger telescopes

The next generation of optical space telescopes could feature huge mirrors made of a lightweight membrane that are deployed using a nickel-titanium alloy.

Aerospace firm Lockheed Martin Corp. has been issued a patent for "a lightweight active mirror" made of thin layers of composite material bonded to ultra-thin strips of a shape-memory alloy. The alloy of choice is NiTiNOL, a roughly equal mixture of nickel and titanium.

"One of the real interests (in astronomy) is looking for planets that are orbiting distant stars," says the mirror's inventor, Lockheed Martin Fellow Stephen Winzer of the company's Space Systems Advanced Technology Centre in Palo Alto.

"As you might expect, to do that you need very large apertures, big telescopes. And to put something that big into space is a real issue … there's been a lot of research and development driven towards making very lightweight mirrors so that you can lift them into space and use them for these kinds of observations."

The mirror would be stowed for launch and unfurled in orbit, and that's when the nickel-titanium alloy comes into play. "Its purpose is to give the membrane its initial shape," Winzer explains. "It serves to tighten the membrane in the structure." Heat is applied to strips of NiTiNOL attached to the membrane – each strip would be a micron thick and a few centimetres wide – causing both to change shape until the membrane assumes its proper position. Winzer likens the process to stretching plastic wrap over the rim of a bowl, creating a tight drum-like surface.

'Heavy Metal' Does Not Necessarily Mean 'Toxic'

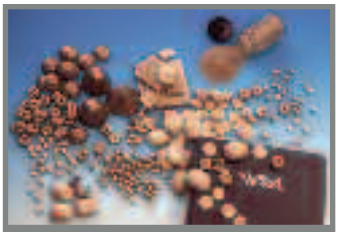
Lumping nickel with other 'heavy metals' does a great disservice to a metal critical to many useful alloys

The lack of a clear definition of the term "heavy metal" and its common use as a substitute for "toxic substance" continues to cause confusion in public debate.

Once used to describe a large gun, the term now has at least 38 different definitions, according to "'Heavy metals' – a meaningless term?", a report of the International Union of Pure and Applied Chemistry (IUPAC). "Heavy metal" definitions can refer to any¬thing from density and atomic weight or number to chemical prop¬erties or toxicity. As a result, lists of "Heavy Metals" may differ from one set of regulations to another. Often the term is used with¬out specifying the metals to which it applies.

"What is surprising is the persistence of the term and its continu¬ing use in literature, policy and regulations, with widely varying def¬initions leading to confusion of thought, failure in communication, and considerable waste of time and money in fruitless debate," wrote J.F. Duffus, author of the IUPAC report, published in Volume 74 of Pure and Applied Chemistry, 2002. His complaint still rings true.

There is a tendency to believe that all "heavy metals" and their compounds have toxic properties – "a false assumption", says Bruce McKean, Director of Stewardship and Sustainable Development for the Nickel Institute. "Virtually any substance will be toxic at a certain level," he says, "because toxicity is a function of dose." And just because a metal is dense or "heavy" does not mean it has more toxic potential than a relatively "light" metal." Berillium, for example, is a low atomic mass metal with high toxic potential and iron is a metal with and atomic mass nearly the same as nickel that has a low potential to be toxic. Similarly, among the high atomic mass metals, cadmium, mercury, lead and uranium have a high toxic potential where as gold, indium and niobium have a low potential (see accompanying table). Ultimately, it is not the mass of the metal that determines whether it is toxic or not at equivalent mass exposures.



VARIOUS FORMS of pure nickel products

IMAGE CREDIT

Bioavailability, the degree of availability of a substance to be taken up by biological organisms, is also an important consideration when metals are classified based on assessments of toxicity, according to Duffus. This is an important consideration since the amount of a metal absorbed into the body cannot exceed the amount that is available for absorption. Availability is determined by the release (corrosion) of metal ions from the surface of a metallic object. Obviously, if a child swallows a "nickel" the whole coin is not absorbed into the bloodstream, only some of the ions that are corroded from the surface of the coin in the stomach.

Duffus had thought that the term "heavy metal" would soon become obsolete because it no longer had any consistent meaning, and yet four years after he wrote his paper, the term is still widely used, and there is a lingering misguided tendency to group pure metals simply by their atomic mass.

Duffus suggested metals be classifed according to their position in the periodic table, in which elements are grouped according to chemical reactivity and, by association, behavior in the environment. A more precise classification according to Duffus would group metallic elements based on their Lewis acidity, or net positive charge, which determines their interaction with living systems.

MORE INFORMATION:
www.nickelmagazine.org/heavymetal

Are All 'Heavy' Metals Toxic?

Both 'Light' and 'Heavy' Metals Have High, Medium and Low Potential To Be Toxic

Metal (chemical symbol)	Atomic Number	Atomic Mass	Toxic Potential
Beryllium (Be)	4	9.0	high
Iron (Fe)	26	55.8	low
Nickel (Ni)	28	58.7	medium
Niobium (Nb)	41	92.9	low
Cadmium (Cd)	48	112.4	high
Indium (In)	49	114.8	low
Gold (Au)	79	196.9	low
Mercury (Hg)	80	200.6	high
Lead (Pb)	82	207.2	high
Uranium (U)	92	238.0	high

Damage Avoidance

General Motors patents a shape memory alloy mechanism that lifts your hood in the event of a collision

A nickel alloy could be an integral part of a newly-patented mechanism to make engine hoods, trunk lids and other vehicle components more crash-resistant.

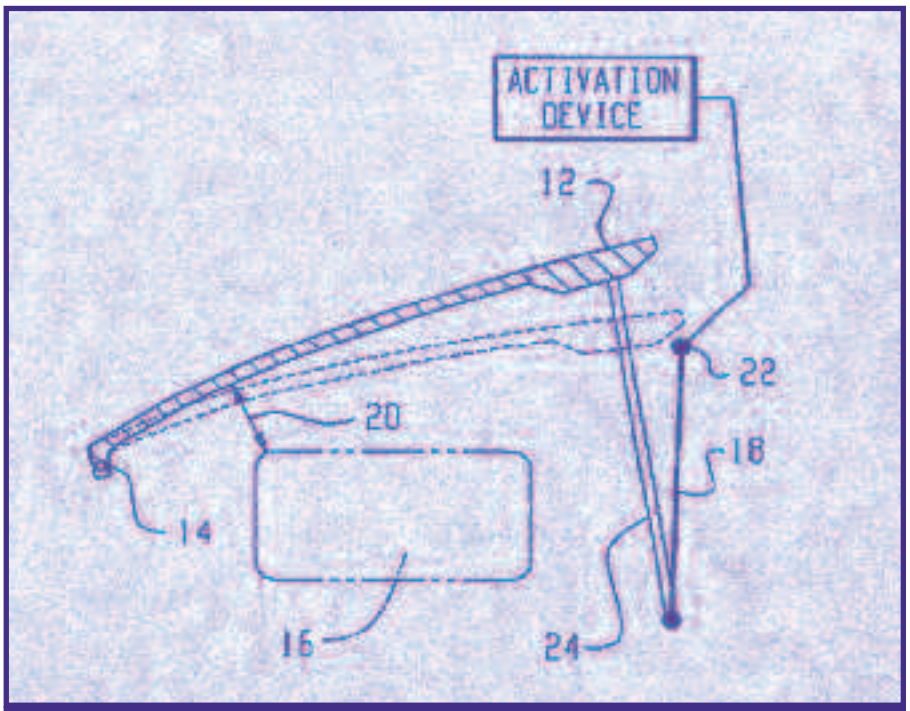
General Motors (GM) was issued a patent in June 2006 for a hood lift mechanism that uses so-called "active materials" to lift and tilt parts of a vehicle when crash sensors are activated. The addition of a shape memory material – NiTiNOL, a 50-50 blend of nickel and titanium, is among the favoured alloys – would allow the components to return to their original shape in minor crashes, avoiding costly repairs.

In its filing with the United States Patent Office, GM notes that engine hoods (or "bonnets," as they're known in the U.K.) and other hinged vehicle components are made of thin sheet metal supported by stamped ribs. Efforts to make vehicles more aerodynamic and fuel-efficient, as well as sleek and stylish, require that front-end hoods be extremely close to the engine components beneath them.

If a vehicle is involved in a collision, the hood is unable to absorb as much of the energy of the crash before bottoming-out against the engine. That's where a hood lifter comes into play: activated by impact sensors, it increases the space between the hood and the compartment it covers.

"The hood lifters change the orientation of the hood by raising it above the engine compartment," GM notes in its patent filing. (In most mechanisms, the hood is raised at a rear edge while maintaining attachment of a front edge to the vehicle structure.) "Because of the increase in clearance, there is an increase in the amount of the energy that can be absorbed by deformation of the sheet metal before bottoming out."

There's one drawback: if the lifting mechanism is activated in a minor fender-bender, the hood would have to be replaced or repaired. Still, the addition of shape memory materials, which deform and reshape in response to variations in temperature, means the mechanism can return to its original shape as soon as crash sensors are de-activated.



IN THIS PATENT, the hood (12) of a car would be lifted by a rod (24) which is connected to a so-called 'active' material (18) such as NiTiNOL. The shape memory alloy is joined by a connector (22) to a device which activates it by a thermal signal. In the event of a crash, the activation device sends an electrical signal which changes the temperature of the shape memory alloy causing it to contract, thereby increasing the clearance distance (20) between the hood and the engine (16) by pivoting about a hinge point (14).

IMAGE CREDIT

CRUMPLED HOODS such as this could result in less damage to an engine if the hood were to be lifted during a collision.

PHOTO: ISTOCKPHOTO

The patent states that the technology could also be used to build passenger doors, trunk lids, fuel tank lids, cargo hatches, and lift gates.

Millions of vehicles could potentially be equipped with the lifting mechanism. GM officials say each mechanism would use about 50 grams of nickel-containing material.

For the shape memory alloy, patent number 7,063,377 specifies NiTiNOL. (NiTi is the trade name for a nickel-titanium alloy; NOL stands for Naval Ordnance Laboratory, which is where the alloy was discovered in the 1960s.) The shape memory would be commercially available from California-based Shape Memory Applications Inc.

The patent also specifies nickel-aluminum and nickel-gallium alloys as candidates for the shape memory material, along with a long list of alloys of copper, platinum and cadmium, and shape memory polymers such as thermoplastics.

The patent is assigned to General Motors and the University of Michigan. The inventors are Diann Brei, John Redmond, Nathan A. Wilmot, Alan L. Browne, Nancy L. Johnson and Gary L. Jones.

MORE INFORMATION:
www.nickelmagazine.org/patent

POWERING Up

Nickel and the Nuclear Future

Nuclear power and stainless steel continue to go hand-in-hand

STEAM GENERATORS AT THE HEART OF THE REACTOR

Concern over global warming and ballooning oil prices has driven interest in nuclear-generated power to its highest level since the 1970s. It isn't surprising, then, that demand for nickel-containing alloys, valued for their corrosion resistance and high-temperature performance, is expected to rise as well.

Greenpeace co-founder Patrick Moore and scientist/environmentalist James Lovelock have thrown their weight behind nuclear power as a low-polluting source of energy which will see us through to the time when fusion energy becomes viable. "I do not see nuclear energy as a panacea but as an essential part of a portfolio of energy sources," Lovelock writes in his best-selling *The Revenge of Gaia: Why the Earth is Fighting Back – and How We Can Still Save Humanity* (Allen Lane, U.K., 2006). He adds that "new nuclear building should be started immediately."

Moore, who is co-chair of the recently launched Clean and Safe Energy Coalition, says nuclear power just might be the energy source that can save our planet from catastrophic climate change.

The world's uranium producers are already poised to meet the demand. "We're seeing a rebirth of nuclear power, driven by the environmental argument to reduce emissions," says Alice Wong, vice-president, investor relations and corporate communications, for Canadian-based Cameco, the world's largest producer of uranium oxide or yellow cake.

In China, five plants are under construction, six are planned, and 19 are proposed, according to the World Nuclear Association. By 2020, that country's National Leading Group for Nuclear Power Self-reliance Development wants installed capacity in operation to reach 40 gigawatts and installed capacity under construction to be at 18 GW. That translates to 30 new nuclear power stations over the next 15 years, which would render China the world leader in nuclear power growth.

Westinghouse Electric Company, which designs reactors and manufactures stainless steel and nickel alloy components for them, has put out competitive bids for four new plants in China, according to Scott Shaw, the company's communications consultant, nuclear power plants.

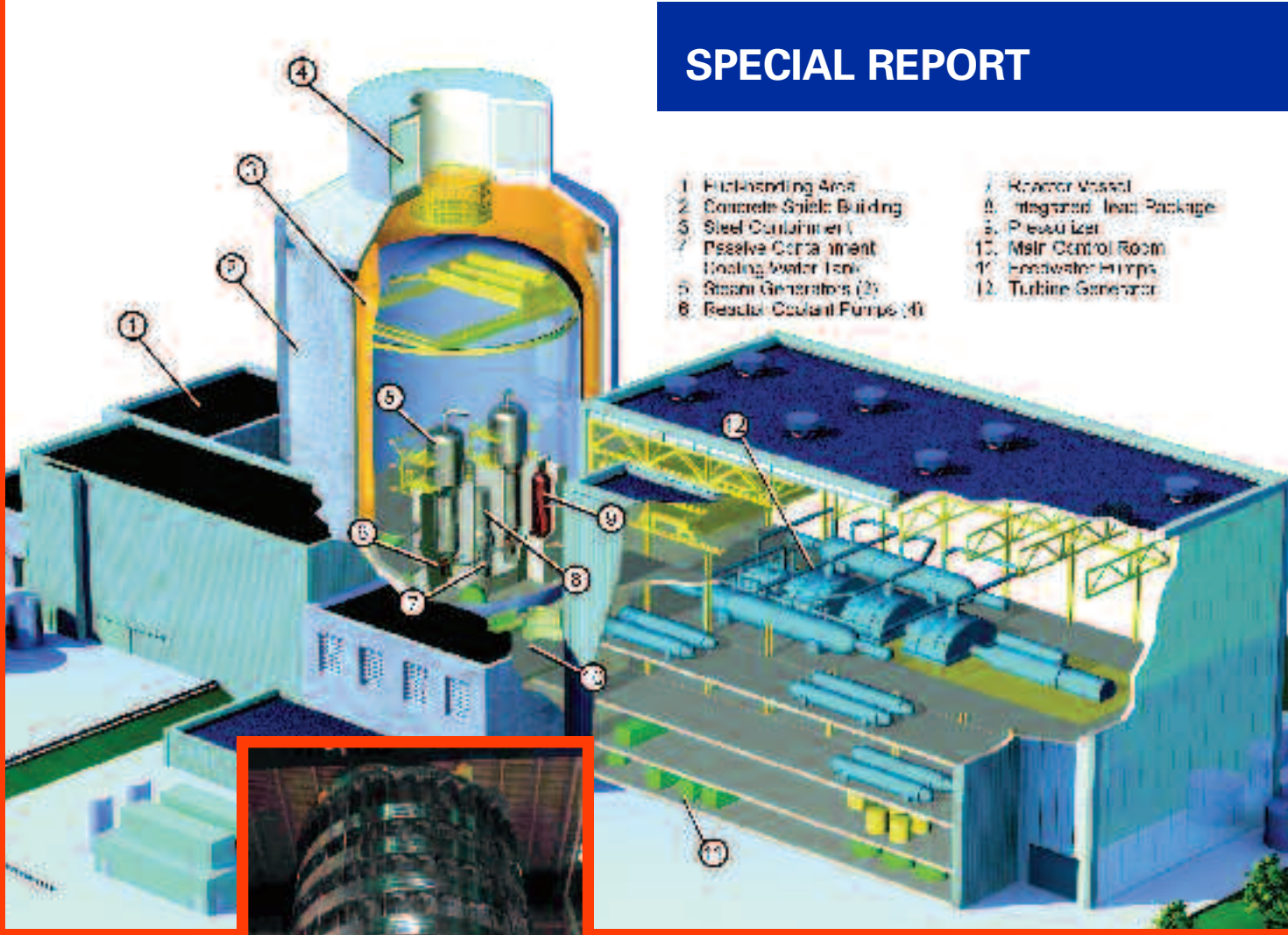
South Korea has had the largest nuclear energy build program of any country. Says Chris Hoffman, fellow engineer, metallurgy, with Westinghouse: "Since about 1998, our primary customer has been South Korea, for which we have manufactured reactor vessels, internals, control element drive mechanisms, reactor coolant pumps, and associated supply hardware."

In Europe, the attitude toward nuclear power is increasingly

NUCLEAR POWER FACTOIDS

Plants Worldwide:	441
Power Production:	368,496 Megawatts Net
Under Construction:	27 in 11 Countries
In Planning Phase:	38 in 11 Countries
Proposed:	113 in 11 Countries
Countries with the Most Plants:	United States (103)
Country with the Highest Contribution to the Power Grid:	France (75% of the Nations's Power)

Source: World Nuclear Association (Figures Valid as of March 31, 2006)



INSIDE GENERATOR

STAINLESS STEEL CONTAINMENT

NICKEL ALLOYS ARE ESSENTIAL

favourable. Among the many countries boosting their nuclear generating capacity is Finland, which has a fifth reactor under construction, due to begin operation in 2009.

North America is likewise poised to boost its nuclear output. Yong Kim, nuclear sales manager with Canadian-based Babcock & Wilcox, which makes equipment for the nuclear industry, says things haven't looked this bright in twenty-five years. "We are quite optimistic about new builds in North America. . . . For the United States it is a matter of 'when', not 'if'."

For producers of nickel-containing alloys, perhaps the biggest cause for optimism is licence renewals. "Most likely every plant in operation in the U.S. will apply for licence renewal," says Shaw, and with licence renewals come repairs and refurbishing, which often require large contracts for plant equipment that contains nickel.

With the nuclear renaissance comes increased demand for stainless steel and specialized nickel alloys. Decades of operational experience have proved that, for many applications, there is no viable substitute for nickel-containing alloys. In refurbishing projects, replacement stainless steel offers considerably lower maintenance than original carbon-steel components.

Westinghouse manufactures nuclear power plant components of stainless and high-alloy steels at its Newington Operations facil-

continued on page 10

...continued from page 9

ity in New Hampshire. The facility uses 15 to 20 different nickel-containing base metals and 8 to 10 different filler metals. Applications range from high-tonnage applications in reactor vessel internals, in which one might find up to 200 tonnes of S30400, to nickel alloys, such as N06625 and N07750, in control element drive mechanisms. Another application of S30400, and of S31600, is in piping that's in contact with the primary coolant, and the piping that delivers the reactor-heated water to the steam generators. In all these applications, the alloys are chosen for their resistance to corrosion.

"Most original nuclear plant service water piping consisted of lined or coated carbon steel, but a lot of plants have replaced parts of their systems with stainless," says Dr. James Fritz of the consulting service TMR Stainless in Pittsburgh, Pennsylvania. However, maintenance problems, including corrosion of S30400 and S31600 stainless steels (due to the "aggressiveness" of the water, as caused by the presence of bacteria and high chloride levels), have forced utilities to take another look at their materials selection.

For example, the Salem Nuclear Generating Station in New Jersey began replacing S30400, S31600 and polyethylene-lined carbon steel service water piping with 6% molybdenum stainless steel on a large scale in 1988. The replacement program has comprised 2,290 metres of 254 SMO ™ (S31254) AL6XN ™ and 25-6MO ™ (both N08925) pipe ranging from 19 to 508 millimetres (mm) in diameter.

This year saw the publication of the Code Case for S32205 (N-741) for class III construction in the seventh supplement of the American Society of Mechanical Engineers (ASME). The code case opens the door for material that sits midway in corrosion resistance between 316 and 6% Mo. Recently, Duke Energy of Charlotte, North Carolina, received approval from the ASME to use S32205 duplex stainless steel for safety-related service water piping systems.

There is also a materials change in the area of steam generators, where 315° C water from the reactor heats water on the secondary side to 277° C to make steam to run the turbines.

A steam generator might weigh 500 tonnes or more; about 10% of that weight consists of 4,000 to 15,000 alloy tubes ranging from 12.4 to 21.3 metres long with an outside diameter of 19.1-22.2 mm and a wall thickness of 1.02-1.27 mm.

In the U.S., early steam generator tubing was made of N06600, which has suffered from stress corrosion cracking. "(The cracking) is caused by residual stresses and an aggressive water chemistry," explains Richard Klarner, manager, engineering technology and proposal engineering, with Babcock & Wilcox. "It is a very harsh localized chemical environment within the heated crevices."

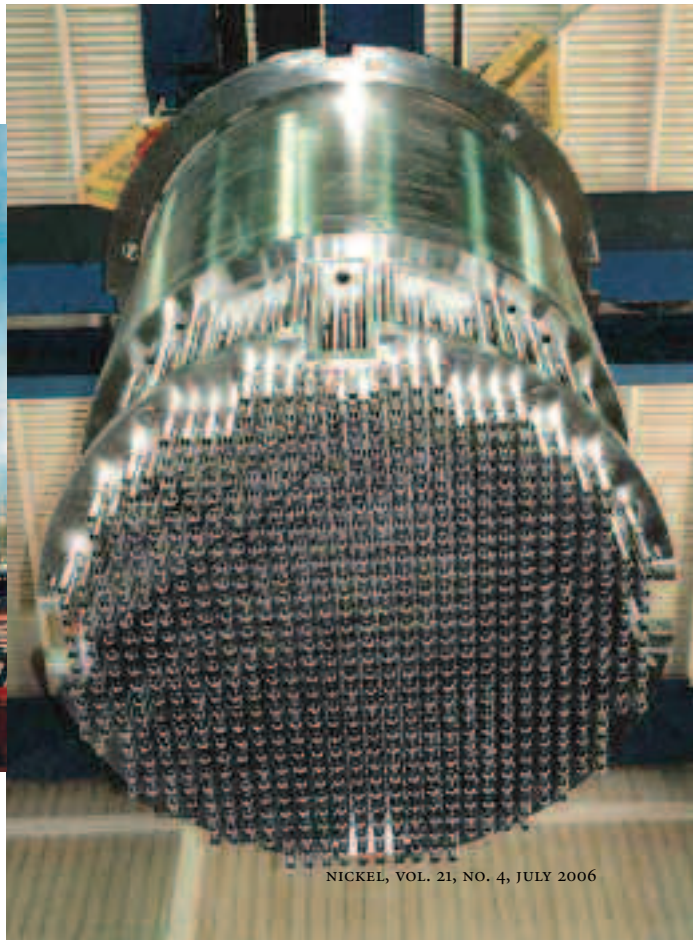
Over the past 15 years, B&W has replaced tubes in 42 steam generators in the U.S. with tubes made of N06690. Another alloy, Alloy 800, continues to prove beneficial in other plants. B&W has a contract to replace twenty-four 120-tonne steam generators at Bruce Power's Bruce A nuclear power plant in Ontario, Canada, using Alloy 800.

Whether for refurbishing existing plants or building new ones, nickel steels and alloys continue to play an irreplaceable role in the nuclear power industry.

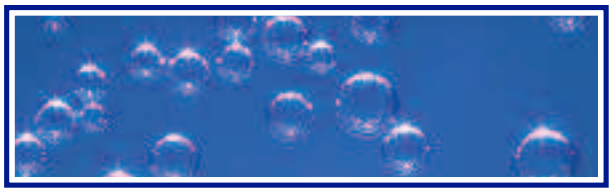
MORE INFORMATION:
www.nickelmagazine.org/who

PHOTOS: ATOMIUM

STEAM GENERATORS HAVE UP TO 15,000 NICKEL ALLOY TUBES ▸
NEW TECHNOLOGY HAS BROUGHT NEW ALLOYS TO NUCLEAR POWER ▾



Delivering with Confidence



GERMANY'S WATER INDUSTRY LOOKS TO THE FUTURE WITH LONG-LASTING HYGIENIC STAINLESS STEEL

While stainless steel has yet to gain commonplace application for drinking water systems in the United States, it has enjoyed growing acceptance over the past 25 years for extraction, treatment and distribution of drinking water in Germany. And for obvious reasons – the life-cycle cost of stainless components provides a clear advantage because stainless seldom if ever requires replacing in long-term, infrastructures such as drinking water installations.

While there are numerous different stainless components in contact with drinking water, including pipes, valves, reservoir linings and others, they are generally made of S30400 or S31600 stainless steel, depending on the chloride content of the water. In addition, there are other stainless components in water installations, including reservoir access doors, railings around the doors, and manhole covers over well extraction chambers, that are in contact with the atmosphere, rather than with the water, and may be made of S30400, S31600 or other stainless grades, depending on the environmental requirements.

From the examples on this page, it is clear that Germany has embraced stainless for drinking water applications and established the engineering and economic superiority of stainless over alternative materials.

MORE INFORMATION:
www.nickelmagazine.org/who

PHOTOS: CREDITT TO COME

Extracted water goes to numerous water works where much of the piping is stainless, which is highly resistant to erosion under high-speed, turbulent flow conditions.

Both above photographs are examples of purified drinking water storage in reservoirs, commonly equipped with lining of stainless sheet and protected by stainless access doors, often surrounded by stainless steel railings.

Thousands of metres of stainless piping of different sizes have been installed in numerous German water installations, conveniently connected by stainless press-fittings, usually grade EN1.4401 (UNS#?)

The Neuschwanstein fairy tale castle in Bavaria, a major tourist attraction, has a new heating system requiring 1500 metres of stainless pipe.

In addition to drinking water, the Bräurosl Oktoberfest tent in Munich also has a stainless sanitary system to meet the tough requirements of 10,000 beer drinkers, each handling litre jugs of beer.

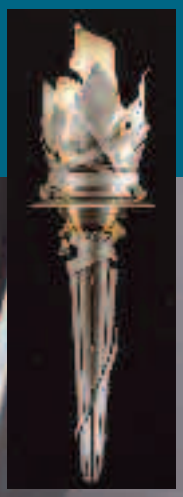
Sentinel 2003

Napels Portal Gates 2000

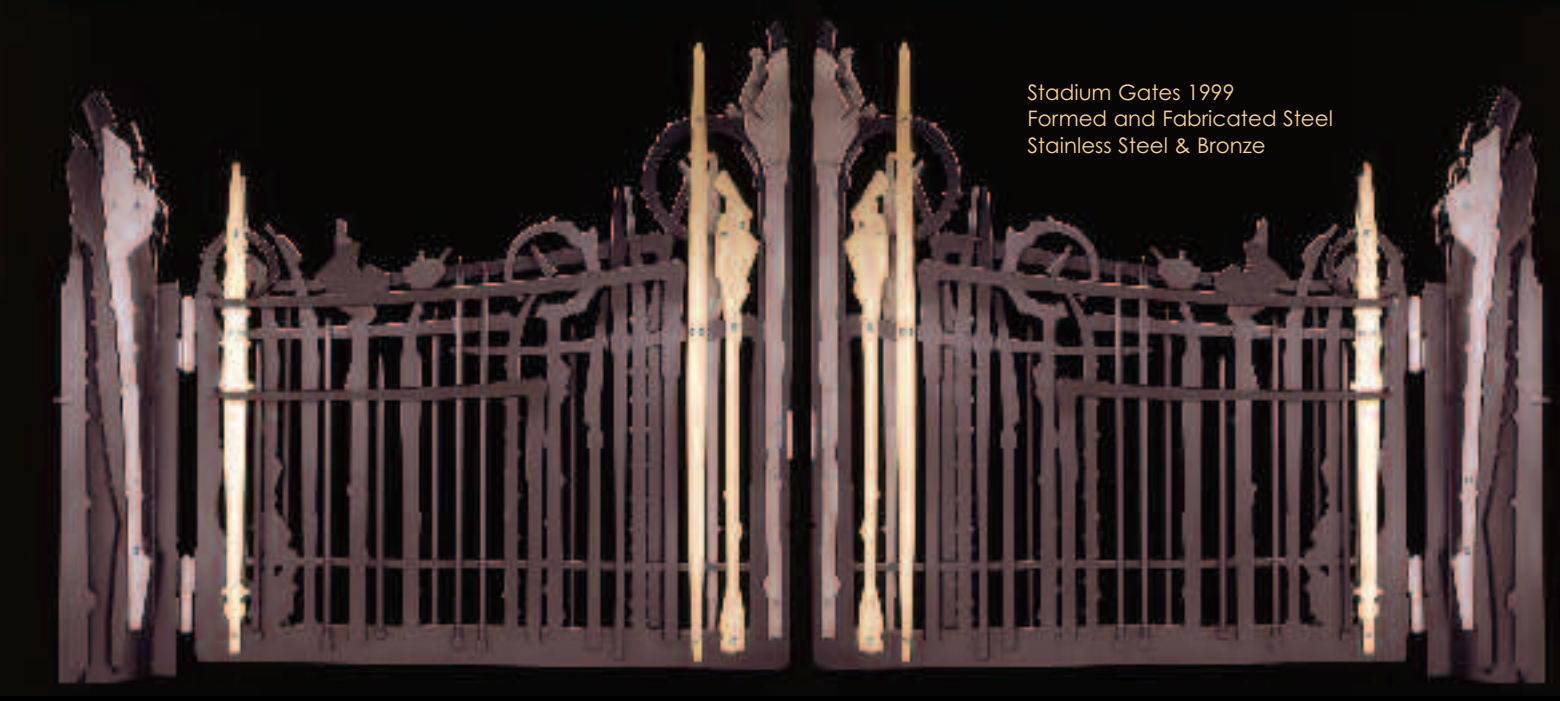
Napels Portal Gates (Details)

Constellation 2002

"The strength of Paley's design, the distinctive characteristics of his art, and the magnificence of its execution all combine to make a work of enduring quality." **Architect Thomas Ventullett**



Torchière 2000



Stadium Gates 1999
Formed and Fabricated Steel
Stainless Steel & Bronze

Integrating Art and Architecture

Albert Paley Forges a Large Aesthetic

For more than 30 years, master sculptor Albert Paley has been exploiting cor-ten and stainless steel for their structural properties and aesthetic value.

One of the world's most recognized and sought-after artists, Albert Paley is an innovator who has built his reputation on a genius for forging metal into striking, large-scale sculptures in exterior locations. At his workshop, Paley Studios in Rochester, New York, he and his staff practise a variety of metal-working disciplines, almost all of it hands-on and highly refined.

"The allure of Paley's art comes through its intrinsic sense of integration of art and architecture," says noted American architect Thomas Ventulett. "It is not all revealed at once. You are compelled to visit it again and again, and each time rewarded with a new vision. The strength of his design, the distinctive characteristics of his art, and the magnificence of its execution all combine to make a work of enduring quality."

Rotunda Gate 1997

"To create visual contrast, I like to offset the colour of stainless with that of cor-ten and other materials," says the 62-year-old, Philadelphia-born artist. "The contrast of the very dark, rich-brown, rust-like appearance of the Cor-ten® with the bright stainless steel next to it heightens the visual experience, and in some cases we add bronze to contribute to the contrast."

With stainless steel, Paley says, it's possible to achieve an amazing exactitude in metal-working processes: "As well as having structural integrity, it machines well, it forms well, it joins well. Stainless steel is just a nice, clean material."

As an artist, he values stainless for its distinctive reflective quality.

"With stainless, there's not a coating; there's not a covering; it speaks of the metal itself, and it speaks of the plasticity of the metal, which is extremely important for the work I do.

"We use a satin, not a matte, finish, partly to prevent any reflections that might be disturbing. Stainless has subtle reflective qualities which help accent the form of the work. This is especially desirable for works that are placed out of doors. The play of light and shade as the sun passes creates a dynamism. With the satin/stainless steel, it almost appears as if light is coming from the material itself, as if it's being absorbed and reflected out. This gives a sense of liveliness and clarity, which is especially effective in regions where the sky is often overcast."

For his exterior pieces, Paley uses S31600. Not only are both corrosion-resistant and maintenance-free; ey're strong enough structurally to support works of the massive scale for which Paley is renowned (to cite one example, The Sentinel, at the Rochester Institute of Technology, weighs 100 tonnes and stands 21 metres tall!). "I prefer doing large-scale work in stainless as opposed to bronze because bronze doesn't have the same structural integrity," he says.

MORE INFORMATION:
www.nickelmagazine.org/who

Rotunda Gate (Detail) Formed and Fabricated Stainless Steel

REACH

A "chemicals management" regulation entitled 'Registration, Evaluation and Authorization of Chemicals', or REACH for short, is due to come into force in the European Union in April 2007. Designed to minimize the risk of any adverse affects to workers, consumers and the environment of exposures to chemical substances (including nickel and nickel compounds), it will have far-reaching effects on companies which produce, import or sell nickel raw materials, nickel or nickel compounds in the EU.

Earlier this year, the Nickel Institute launched an implementation plan to help member companies to cost-effectively comply with the requirements of REACH. Consortia are being established consisting of Nickel Institute members and other willing, importers, manufacturers (EU and non-EU) and downstream users of nickel. The purpose of the consortia is to have the Nickel Institute provide various services that will facilitate the process.

It is worthwhile to note that the REACH obligations apply to both manufacturers in the EU and importers into the EU as soon as they import or sell more than one tonne into the EU. Non-EU manufacturers are required under the legislation to appoint an "EU only representative" at the start of the process.

MORE INFORMATION:
www.nickelmagazine.org/inbrief

A Strategy for Reducing Risk

The Nickel Institute plans to engage all of its members as well as downstream users of nickel and national/international metals interest groups in an important two-day strategy session in Antwerp, Belgium.

WORKPLACE EXPOSURES to nickel are closely regulated and monitored.

Scheduled to take place on September 20-21, the Risk Reduction Strategy Workshop is designed to help participants develop a strategy that will ultimately reduce the risk of adverse affects of nickel and nickel compounds on human health and the environment.

The aim of the workshop is to ensure that attendees understand the main conclusions of the European Union's Risk Assessment on Nickel and Nickel Compounds and to fully appreciate what is legally required in the risk reduction phase of the EU regulatory process.

Workshop participants, who will pay a registration fee of € 300, will explore the various best available technologies for reducing these risks. The workshop will provide an opportunity for participants to contribute to the selection of preferred technological options.

Registration is requested before August 11.

MORE INFORMATION:
www.nickelmagazine.org/inbrief

Appointment

Victor Korchenko

NICKEL INSTITUTE

Victor Korchenko has been appointed Director, Finance, Planning and Systems of the Nickel Institute.

A certified accountant in his native Russia and designated CMA in Canada, Victor Korchenko "brings a wealth of financial experience from both large and small companies from a range of industries," says Nickel Institute President, Stephen Barnett.

In Russia, Mr. Korchenko held senior finance and administrative positions in the construction, tobacco, food processing and software industries before becoming Finance and Administrative Director for the U.S. advertising firm McCann-Erickson's office in Moscow in 1999. He immigrated to Canada in 2000 to become Senior Accountant for Thistle Mining Inc. of Toronto and then Controller for Engineering .com, an e-commerce and software company in 2003.

Mr. Korchenko's responsibilities will include the planning, administration and communications responsibilities previously held by James Lilly who is working part-time until November 2006. Victor Korchenko will be based in the Nickel Institute's head office in Toronto.

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	H	Mn	Mo	N	Ni	O	P	Pb	S	Si	Sn	Ti	V
N08925 P. 10	-	-	0.020 max	-	-	19.0-21.0	0.80-1.5	rem	-	1.00 max	6.0-7.0	0.10-0.20	24.0-26.0	-	0.045 max	-	0.030 max	0.50 max	-	-	-
N08800 P. 10	0.15-0.60	-	0.10 max	-	-	19.0-23.0	.75 max	rem	-	1.5 max	-	-	30.0-35.0	-	0.045 max	-	0.015 max	1.00 max	-	0.15-0.60	-
N07750 P. 10	0.40-1.0	-	0.08 max	0.70-1.20	-	14.0-17.0	0.5 max	5.0 9.0	-	1.0 max	-	-	70.0 min	-	-	-	0.01 max	0.50 max	-	2.00-2.60	-
N06690 P. 10	-	-	0.05 max	-	-	27.0-31.0	0.50 max	7.0-11.0	-	0.50 max	-	-	58.0 min	-	-	-	0.015 max	0.50 max	-	-	
N06625 P. 10	0.40 max	-	0.10 max	3.15-4.15	-	20.0-23.0	-	5.0 max	-	0.50 max	8.0-10.0	-	rem	-	0.015 max	-	0.015 max	0.50 max	-	0.40 max	-
N01555 (NiTINOL) P. 5 & 7			0.07 max	0.025 max	0.05 max	0.01 max	0.01 max	0.05 max	0.005 max	-	-	-	54.0-57.0	0.05 max	-	-	-	-	-	rem	-
S31254 P. 10	-	-	0.020 max	-	-	19.50-20.50	0.50-1.00	-	-	1.00 max	6.00-6.50	0.180-0.220	17.50-18.50	-	0.030 max	-	0.010 max	0.80 max	-	-	-
S32205 P.10	-	-	0.030 max	-	-	22.0-23.0	-	-	-	2.00 max	3.00-3.50	0.14-0.20	4.50-6.50	-	0.030 max	-	0.020 max	1.00 max	-	-	-
S30400 P. 10, 11	-	-	0.080 max	-	-	18.0-20.0	-	-	-	2.00 max	-	-	8.0-10.50	-	0.045 max	-	0.030 max	1.00 max	-	-	-
S31600 P. 5, 10, 11, 13	-	-	0.08 max	-	-	16.0-18.0	-	-	-	2.00 max	2.0-3.0	-	10.0-14.0	-	0.045 max	-	0.030 max	1.0 max	-	-	-

NICKEL INSTITUTE

Retirement

Alfred (Fred) Bauer, a long-time consultant to the Nickel Institute (and previously the Nickel Development Institute) has retired.

Bauer began his career in the nickel and stainless steel industry in 1961 when he provided consulting services on behalf of International Nickel in Brussels. He moved in 1965 to Inco's office in Zurich to become General Manager.

Bauer was engaged in the founding of the Swiss Stainless Steel Development Association in 1968 and remains the President of that organisation to this day.

He was also involved in the formation of the European Stainless Steel Development and Information Group (ESSDIG) in 1967 and subsequently the European Stainless Steel Development Association, Euro Inox, in 1989. He was President and General Secretary of Euro Inox for nine years.

NICKEL INSTITUTE

Alfred (Fred) Bauer

He wrote many articles for this magazine, including one on miniture jet engines that is one of the most-visited pages on our website (www.nickelmagazine.org/jets). His other articles include one on stainless steel Swiss watches (Sept. 2001) and one on bio-gas production (November 2001).

NICKEL INSTITUTE RESOURCES

16,460
The number of "Did You Know?" cartoons viewed in the first seven months of 2006.

4,176
The number of people who have downloaded our latest technical publication (Fabricating Stainless Steels For The Water Industry).

2,636
The number of people who have watched our "Magic of Nickel" online video presentation (launched in November 2005).

COMING EVENTS

SUR-FIN 2006

CHROMIUM-NICKEL PLATING

PHOTO CREDIT

SURFACE FINISHERS will meet September 17-19, 2006 in Milwaukee, Wisconsin, U.S.A. for SUR-FIN 2006. This annual, international event features the latest process and environmental protection technology, including those used by chromium-nickel platers. The conference also features the latest information on emerging regulatory changes in various jurisdications around the world. For more information, see: www.sur-fin.net

STAINLESS STEEL CONFERENCE Billed as the most prestigious event in the global stainless steel community, the 9th World Stainless Steel Conference, will be held in Dusseldorf, Germany, Sept. 17-19, 2006. Senior executives who will share their vision for the industry include Dr. Ivor Kirman, former President of the Nickel Institute and David Humphreys, Chief Economist for Norilsk Nickel. For more information, see: www.cruevents.com

PRODUCERS AND USERS OF NICKEL are invited to meet in Antwerp, Belgium, September 20-21, 2006 for an important strategy session. Organized by the Nickel Institute, this Nickel Risk Reduction Strategy Workshop will assist participants to select preferred technical options for reducing the risks to human health and the environment posed by exposures to nickel compounds (see story, page 14). For more information, see: www.nickelmagazine.org/inbrief

AUSTRALIAN NICKEL producers and exploration companies will meet Oct. 18-19, 2006 in Perth, Western Australia for the Australian Nickel Conference. Organized by Paydirt Media, this conference offers an opportunity for nickel exploration companies to present their projects to senior nickel producers and other potential investors. For more information, see: http://www.australiannickelconference.com/index.php

THE 3rd PACIFIC RIM STAINLESS STEEL FORUM will be held this year in conjunction with the annual conference of the Australian Stainless Steel Development Association. The two events will take place at the Sunshine Coast, Queensland, Australia, Oct. 25-27, 2006. For more information, see: http://www.assda.asn.au

NICKEL, STAINLESS FORUM The 5th International Nickel, Stainless and Special Steel Forum will be held November 8-10, 2006 in Brussels, Belgium. Organized by Metal Bulletin and SMR, it brings together the industry's key players to discuss the current hot topics such as supply/demand fundamentals, prices and emerging markets. A field trip to Arcelor Stainless' new Carinox steel plant in Charleroi, Belgium is planned. For more information please contact: Tel: +44 (0) 20 7827 9977, E-mail: enquiries@metalbulletin.com

CORROSION-RESISTANT ALLOYS A 2-day conference and expo, entitled Stainless Steel World Solutions USA 2006, is planned for November 14-16, 2006 in Houston, Texas. This event explores the development, production, distribution, marketing, sales and procurement of corrosion-resistant alloys. Topics include: metallurgy, duplex and lean duplex stainless steels, new alloy development, oil & gas case histories, chemical processing applications and welding. For more information, please contact: Stainless Steel World, The Netherlands. Tel: +31 575 585 270. E-mail: sswsolutions06@kci-world.com

RECYCLING International Congress & Marketing is holding a World Recycling Forum November 14-17, 2006 in Shanghai, China. An international conference and expo, it will provide an opportunity to exchange information and to meet partners and clients. Topics will include car, electronics and battery recycling, the latest developments in recycling, best available technologies, reports and outlooks on new regulations and policies. For more information, please contact: Tel: +41 62 785 10 00. E-mail: info@icm.ch

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Innovation Excellence

Stainless Steel Products Capture 7 German Steel Innovation Awards

The German Steel Innovation Awards, which are presented every three years, attracted 620 entries in 2006. Since the awards are intended to encourage the use of steel of over a broad range of products, 14 prizes are awarded in five categories: architecture, building and research and development; steel products with improved or new applications; and a special prize for small and medium-sized enterprises.

PHOTOS: STAHL-INNOVATIONSPREIS 2006

STAINLESS STEEL PRODUCTS WERE INVOLVED IN SEVEN AWARDS

- An oil burning double-shell "mono-concave" flame bowl for decorative purposes, (pictured) presented by Mono, Industriestrasse 5, D-40822 Mettmann, Germany
- A special rain shower installation for luxury bathrooms, presented by Aloys F. Dornbracht GmbH & Co. KG, Koppingser Muhle 6, D-58640 Iserlohn, Germany
- A wire fabric "media mesh" designed to cover the facades of smaller or huge buildings and, due to the integrated illuminated diodes, to carry changing colours or messages, visible over long distances, presented by GKD-Gebr. Kufferath AG Metallweberstrasse 46, D-52353 Duren, Germany
- A particle filter for Diesel driven cars, (making use of a ferritic heat resistant steel without nickel)
- A "ContiSupportRing" for car wheels, allowing continuing driving to a certain extent with a deflated wheel, presented by Continental AG, Jadekamp 30, D-30419 Hanover Germany
- A simple quick-connect coupler for riser pipes above water wells, presented by Beckert Brunnentechnik GmbH, Industrieweg 11, D-99734 Nordhausen, Germany
- A pedestrian bridge at Leverk, Germany

The 2006 German Steel Innovation Awards were presented at a well attended ceremony at the Philharmonic Hall in Essen, Germany on January 22, 2006 Mr. Wendelin Wiedeking, CEO of Porsche AG was the master of ceremonies.

MORE INFORMATION:
www.nickelmagazine.org/steelinnovation