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Castings from the Far East

80 % of the many castings from the Far East examined and tested by FORCE Technology did not meet the specified requirements and could therefore not be used.

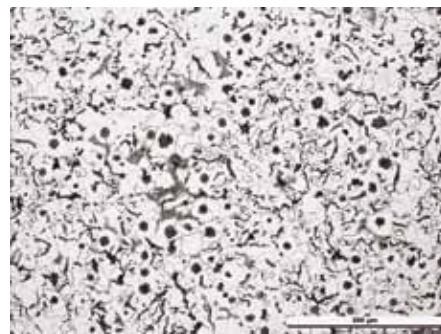


Figure 1: Cast iron, in which the graphite is not only spheric but has also exploded

Reduced mechanical properties

Traditional grey cast iron with lamellar graphite is still applied to a certain extent but the amount of spheroidal graphite cast iron is increasing. Lamellar graphite in the traditional grey cast iron acts like small flat discontinuities in the material, and the mechanical properties (tensile strength and ductility) are not particularly good compared to those of spheroidal graphite cast iron, in which the graphite is placed as spheres. The spheres in spheroidal graphite cast iron are formed by grafting the smelt with magnesium immediately prior to casting. Thus the period of time from grafting the smelt with magnesium until casting is relatively short. If it takes too long, the spheric form will gradually become less and less "exploded" and "longish" (as seen in the microscope) and finally it will turn into graphite flakes instead of spheres. Examples of this are shown in figures 1 and 2 below. If grafting is not performed correctly magnesium slag may occur in the smelt, which will subsequently be observed in the material as long discontinuities reducing the tensile, impact and fatigue strengths. Magnesium slag in the material is also known as "dross".

Trading companies may get in trouble

Technically it is possible to cast all the alloys from applied well-known materials. Certain components for e.g. pressure carrying systems are traditionally made from steel castings. The components are often sold to the end customer by trading companies importing from foundries. These trading companies have also more and more begun to use sub-suppliers from the Far East. FORCE Technology has seen numerous examples that trading companies

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Dear Reader,

Welcome to another edition of Material News, in which we focus on the advantages and disadvantages offered by a globalised world.

You will learn how important it is to keep track of specifications when purchasing castings in the Far East. Unfortunately, we have examples that 80 % of the cast items from the Far East that we examined did not meet the specified requirements and could therefore not be used, which both delays and raises project costs significantly.

Since the last issue of Material News we have invested in a new FTIR microscope, which makes advanced chemical identifications of materials, sometimes down to only a few micrometers.

You may also read about our participation in two international conferences and our much visited seminar on food contact materials. At this seminar the participants were given input on how to handle legislation in the field.

We also present our news as regards personnel and we include our course calendar for 1st half year 2010.

Enjoy your reading!

Nils Linde Olsen
Vice President

Increased interest in the Far East

Over the past years FORCE Technology has had an increasing number of approaches as regards cast iron and steel castings produced in countries such as China, Vietnam, and Korea etc. The interest in producing casting in these countries is highly increasing as the price is low compared to supplies from European and Scandinavian foundries. The castings have been ordered by and delivered to customers in Denmark among others. FORCE Technology has been consulted from time to time as in several cases the supplied castings did not meet the expected quality. The lack in quality has proved to be e.g. a wrong chemical composition in the ordered castings and too poor mechanical properties, deriving from an inadequate micro structure. Huge geometrical defects such as lacking material thickness, porosities, suction, inclusions etc. have also been found; defects to an extent because of which the castings would have to be discarded. The latter types of faults are part of what we denote as classical casting defects which are always more or less to be expected in castings.

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send some of their cast components to foundries in the Far East with an inquiry as to whether the foundry is able to manufacture the actual components. With an affirmation from the foundry the trading company often orders large amounts of components. Despite the fact that sometimes the trading company has a representative at the foundry it may occur that the delivered components do not meet the quality requirements as expected. Defects such as lacking material thickness, suction, micro porosities, sand inclusions, inside edges/dislocations and a wide range of other types of defects are not exceptional, even though the foundry is able to show many years' experience at supplying to the global market and is equipped with the applicable approvals. Seen through the spectacles of the foundry, the customer has been granted a component looking the way he desired.

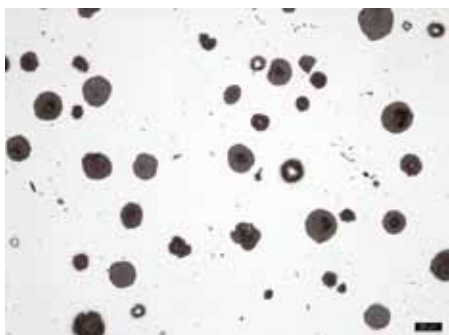


Figure 2: Cast iron with spheres

Weld repairs may result in day fines

Major weld repairs of the castings due to leaks observed during pressure testing also occur. In general, weld repairs on castings should be regarded as part of the actual manufacturing process in a foundry. But weld repairs must be carried out according to an approved welding procedure and often with subsequent heat treatment. If a weld-repaired component is delivered to a customer, this customer and/or a certification body will most often require documentation for such repair. Without documentation the component will probably not be approved. If the component is part of a major plant it may result in delays, day fines etc. Such experiences reduce the credibility of the component supplier.

Full documentation is not always sufficient

Relatively large items are also produced from steel castings. FORCE Technology has seen examples of such large items weighing approximately 10 tonnes. These had been supplied by a foundry in the Far East with full documentation that heat treatment and non-destructive inspection had been carried out and the goods had been found undamaged and in order. The purchaser of the goods however, chose to make his own inspection, which revealed surface cracks. After grinding away the cracks many large cavities, sand inclusions etc.

were revealed in many positions. Based on photos and a drawing of the casting layout we performed an estimate of the possible causes for failure for this customer. In our opinion the casting layout was not at its optimum, which was the most likely cause for the observed failures. According to the foundry, however, the cast items fully complied with what had been promised supplied. The delivery time for such large items may easily be e.g. 5 months. The abovementioned items would probably be discarded undoubtedly resulting in major project delays.

How are castings specified?

There is no set of complete standards specifying with which quality cast iron and steel casting must comply. This is to be agreed between the customer and the foundry in each individual case.

Read more about how the surface conditions are specified by means of comparators and how surface defects and faults in the castings may be detected at FORCE Technology's web-page:

<http://www.force.dk/NR/rdonlyres/61A5002B-2653-4368-B158-92AF2DC617A9/0/Støbegodsfrøstendeligudgave.pdf>

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FORCE Technology at EUROCORR 2009

FORCE Technology made three presentations at EUROCORR 2009 on microbial corrosion and metal release in drinking water.

Lisbeth Hilbert and Frank Fontenay represented FORCE Technology at the European corrosion conference, EUROCORR 2009, from 6-10 September 2009 in Nice, on "Corrosion from the Nanoscale to the Plant". EUROCORR is the largest European conference on corrosion, with approximately 500 presentations from experts all over the world.

Mikrobial corrosion

Lisbeth Hilbert gave two lectures both related to microbial corrosion titled: "Influence of bacteria on silver dissolution from silver-palladium surfaces"

and "Unexpected corrosion of stainless steel in low chloride waters - microbial aspects".

In many cases microorganisms have critical effect on dissolution of metal and may thus be contributory causes to corrosion damage. Lisbeth Hilbert's lectures dealt with the interaction between metals, environmental parameters and microorganisms.

Metal release to drinking water

Frank Fontenay gave a lecture on metal release to drinking water describing new Danish and European examinations of lead and nickel releases titled: "Nickel and lead release to drinking water - Danish and European results". The presentation described a newly

developed rig test for testing nickel release from taps to drinking water.

The test has been developed in a joint European cooperation and simultaneous tests have been performed in Denmark and Germany. Furthermore Frank Fontenay also presented selected results from a survey of lead and nickel release in private domestic installations that FORCE Technology performed on behalf of the Danish Enterprise and Construction Authority in 2008.

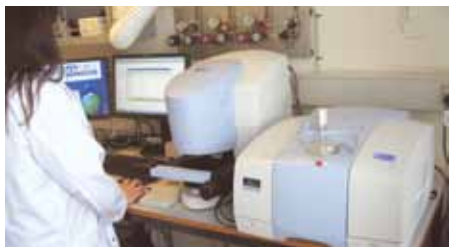
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New advanced FTIR Microscope

With support from "The Danish Council for Strategic Research" (Det strategiske forskningsråd - DSF) FORCE Technology has invested in a new advanced infrared spectrometer and imaging microscope – a so called Chemical Imaging microscope.

Chemical fingerprints

With the new equipment it is now possible to make advanced chemical identification, primarily of organic substances or materials in small areas down to only a few micrometers. The technique is a combination of optical microscopy and infrared spectroscopy, providing a whole new possibility of identifying, mapping and visualising the physical/chemical distribution of incoming com-



ponents in samples of plastic, coatings, laminates, welds, flakes of paint, particles etc. You could say that the method provides a chemical fingerprint of

Facts box:

Infrared spectroscopy is one of the most applied techniques for analysis of chemical compounds. The method exploits the fact that molecules have specific frequencies at which they rotate or vibrate corresponding to discrete energy levels. The frequency of the vibrations can be associated with a particular bond type and thus a specific functional group (for example amino or ester group). The relevant substance is subjected to infrared light at varying frequency and by measuring the transmitted light intensity at a wide range of frequencies; an infrared absorption spectrum may be obtained. The absorption pattern is characteristic for each type of substance and may thus be used for materials identification. You could say that the method provides a chemical fingerprint of a given material.

specific material.

Application:

- Identification of pure substances and compounds, including plastic and rubber materials
- Analysis of thin fibres
- Analysis of small fragments of varnish and paint including adhesives and pigments.
- Identification of particulate contaminations
- Documentation of the distribution of active substances in powder samples/tablets
- Documentation of the homogeneity of various batches
- Mapping of organic pollution on metal surfaces
- Analysis and visualisation of polymer laminates and welds
- Defects analyses, failure and damage investigations.

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Food contact materials

How does the industry handle the requirements for materials and items that are in contact with food? And which risks should the authorities assess on behalf of the consumers?

The above themes were the ongoing focal points during two seminars held by FORCE Technology with 75 participants such as foodstuff manufacturers, equipment suppliers, wholesale dealers, importers and consumer goods manufacturers, for whom materials

and items for foodstuff are part of their range. All items such as packaging materials, kitchen utensils, containers and processing equipment which is expected to be in contact with the goods/foods are subject to this legislation.

Representatives from the Danish Veterinary and Food Administration explained their views on the legislation and the interpretation of it. Through professional inputs on specific materials and on the handling of the requirements for good manufacturing practice, the participants were given an

overview of the field's width and which tools that may help them act correctly.

The National Food Institute, DTU Food, supplemented with a technical assessment of migration from polymers. The active and very interested audience contributed to actualising and specifying the challenges that the industry faces.

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New employee



Simon Rohde Nielsen

Simon Rohde Nielsen is 24 years old and has just completed his education as a Technical Manager Offshore. Simon was employed as technician as per 1 August

2009 with the department for Corrosion and Metallurgy in Esbjerg.

At FORCE Technology Simon will become part of the large group of all-round material technicians who assist daily at the many tasks within materials selection and failure and damage investigation. Simon's primary tasks will include offshore related assignments and service life assessments in power plants; however Si-

mon will also partake in a number of assignments in the department.

Simon has trained as industrial technician (machinist) with Andritz Sprout in Esbjerg, with whom he also worked as a CNC operator in a vertical boring and turning mill.

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Courses in "Corrosion and materials technology" and "Maintenance"

Area	Ref.	Title	Duration	Date (1st half year 2010)	Price DKK
Aluminium	A.1	Aluminium – Materials knowledge	2 days	12-13 January	8.600
	A.3	Aluminium – Surface treatments	2 days	16-17 March	8.600
Construction	B.3	Domestic water installations, materials and corrosion prevention	2 days	9-10 February	8.600
	B.4	Metals' corrosion in construction – galvanic corrosion	1 day	13 April	5.100
Power plants	E.3	Water treatment and corrosion in technical systems	1 day	2 February (Århus)	5.100
Machinery	M.50	Failures and damages – Damage investigation	4 days	2-5 February	14.600
	M.53	Fatigue fractures	2 days	20-21 April	8.600
Stainless steel	R.1	Introduction to stainless steel	2 days	26-27 January	8.600
	R.3	Stainless steel surfaces in the pharma- and biotech industries	2 days	23-24 March	8.600
	R.8	Food safety - Corrosion resistant production equipment	2 days	8-9 February (Vejen)	8.600
	R.76	Corrosion and selection of stainless steel	2 days	9-10 March	8.600
Steel	St.4x	Steel – Surface treatment, paint systems	2 days	2-3 March	8.600
	St.52-I	Steel metallurgy for non-metallurgists, I	2 days	27-28 April	8.600

Sign Up

Please sign up with Jette Jacobsen at +45 43 26 74 26, via mail jtj@force.dk or on our web site www.forcetechnology.com

FORCE Technology at Stainless Steel World Conference & Exhibition 2009

FORCE Technology gave a lecture on corrosion in distillation units for recovery of ethanol at Stainless Steel World Conference & Exhibition 2009.

From 10 - 12 November 2009 Anders Black represented FORCE Technology at the international conference on corrosion and stainless steel production in Maastricht.

Stainless Steel World Conference & Exhibition is a great event displaying numerous companies and forty presentations from experts all over the world.

Corrosion in distillation units for recovery of ethanol

Anders Black gave a presentation on corrosion in processing plants for recovery of ethanol. FORCE Technology has been involved in failure analyses in the chemical and pharmaceutical industries for many years and has thus gained great experience in this field. Anders Black presented a number of cases, and discussed how corrosion in distillation units for recovery of ethanol may be avoided.

Read more about Stainless Steel World Conference & Exhibition 2009 here:

<http://www.stainless-steel-world.net/>



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For more information please use our website: www.forcetechnology.com

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