

Fusion

Newsletter of the Southern African
Institute of Welding

Aug/Sep 2014



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Young Welder 2015 launched

The 2015 Young Welder of the Year competition, which will be held from 26-30 January 2015, has kicked off with a bang with unprecedented interest being expressed in it from all over the country. This is has become the foremost skills test for young welders in South Africa.

The winner will represent South Africa at the WorldSkills competition to be held in Sao Paulo, Brazil, from 11-16 August 2015.

Sponsors committed so far to the 2015 competition are: Abicor Binzel, Afrox, AFSA, Air Products, ArcelorMittal, Columbus Stainless, Hulamin, Merseta, Macsteel, SASSDA, Thuthuka Welding and WASA. *(Please see sponsors logos on page 5.)*

SAIW executive director, Jim Guild, says that the Young Welder competition is an industry initiative and would not survive without its sponsors. "We are all grateful that the sponsors understand the growing importance of this competition in terms of encouraging welding as an exciting and sustainable career for our youth. There's always room for more sponsors, so please contact us if you're interested."

SAIW GM Operations, Sean Blake, says he is delighted with the enthusiasm of the entire industry including both TVET Colleges like College of Cape Town and a company artisan training school – Steinmuller.

"The increased involvement of those who are teaching the youth welding skills is most encouraging and with their support we will be extending the footprint of the competition quite considerably," Blake says. "We are particularly pleased that Steinmuller has opted to be on the organising committee and we look forward to working with them." In terms of the extended footprint Blake says that there will be regional competitions in November 2014 in the Western Cape, KZN and Mpumalanga. "This will give a lot more youngsters the chance to get into the finals in Johannesburg and will, of course, substantially increase awareness of the Young Welder competition," Blake says.



Houston Isaacs 2013 Young Welder of the Year winner with SAIW's Etienne Nell (L) and Frans Vorster

There will also be an increased focus on marketing and promotion for the 2015 competition. "Using the theme 'Creating Employment: Skilling our Youth' we plan to get wide coverage of the competition in the classical media like radio, print and television.

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Limited scopes of CP certification and new limited scope of IPE certification

SAQCC Competent Person

An AIA In-service must use a SAQCC CP Certified inspector to perform the regulatory in-service testing of equipment which falls within the remit of the OHS Act Pressure Equipment Regulations and is classified as Category II or higher in terms of the SANS 347 standard. The User may perform the in-service inspection and test of Category I equipment without the involvement of an AIA In-service but is expected to appoint suitably qualified and experienced personnel to do the work.

The SAQCC CP certification system for **Pressure Vessel** inspectors has for some years included certification categories with a limited scope of application. Certification with limited scope is intended to facilitate application of the regulations in specific industry areas. Certification with a limited scope restricts the scope of activity of the inspector to **air receivers**, typically used as buffer storage vessels in a compressed air system or **autoclaves**, typically used in medical laboratories or **accumulators** used as pressure storage devices in a wide range of engineering applications.

EXISTING SAQCC IPE INSPECTORS ARE UNAFFECTED AND THEIR UNLIMITED SCOPE OF CERTIFICATION ALLOWS THEM TO WORK ON PRESSURE VESSELS, STEAM GENERATORS AND PIPING.

Inspectors training in preparation for applying for a limited scope category need only attend and successfully complete the two week training course consisting of a Foundation week and a Core week. Exemption from the Foundation week is possible with sufficient evidence of prior knowledge of basic welding and NDT. Additionally, candidate inspectors are required to complete a supervised period of practical experience working on the type of equipment for which they are seeking certification. The minimum practical experience period varies from 1 to 5 years according to education and trade skill levels.

Inspectors with limited scope of certification are reminded that performing work outside the stated scope on Category II or higher, equipment is illegal and they can face action through a court of law and through the disciplinary process of the certification system.

Inspectors aiming for the unlimited scope of certification required for general industry work on pressure vessels have to undertake a longer training course which includes the same Foundation week and Core week mentioned above but also includes a four-week Process Plant Module. The same requirement for a supervised period of practical experience applies but training should be on a wide range of equipment.

The SAQCC CP certification system for Steam Generator inspectors does not have categories of limited scope of certification. The course training requirements for steam generator candidate inspectors include the same Foundation week covering basic welding and NDT, as is required for PV inspectors and a Core course. In the case of The Core course for steam generators is different and separate from the

Core course for PV inspectors. It is also longer being two weeks in duration. Applicants for certification are required to show they have worked on a variety of types of steam generators.

SAQCC Inspector of Pressure Equipment

The SAQCC IPE has announced that a limited scope of certification is to be introduced for inspectors working only on piping.



Piping was included in the definition of a pressurised equipment in the Vessels under Pressure Regulations (VUP) and is included in the definition of pressure equipment in the subsequent Pressure Equipment Regulations (PER). The manufacture, repair or modification of piping requires the involvement of an Inspector of Pressurized Equipment (IPE) working under the auspices of an Approved Inspection Authority (AIA). In response to requests from industry SAQCC IPE is to introduce a limited scope of certification covering only piping. This is intended to assist manufacturers and inspection companies working with piping and pipelines as a core business. The details of the requirements for certification are currently being finalised and will be published on the SAIW website in August. Applications for certification will be accepted from 1st October 2014.

Existing SAQCC IPE inspectors are unaffected and their unlimited scope of certification allows them to work on pressure vessels, steam generators and piping.

ND Engineering gets ISO 3834 Accreditation

Specialist fabrication company, ND Engineering, which has extensive experience in the manufacture of equipment for a number of processes using a variety of standard and exotic grades of materials, has achieved ISO 3834 accreditation and ND's MD, Elvis Green, says that this will add considerable value to the ND offering.

"In order to keep one's standards at the highest possible level in our ever-changing industry, it is vital to keep abreast of the latest developments," says Green. "This is why we decided to get ISO 3834 accreditation, which is the fundamental quality benchmark in this industry, which will enhance and strengthen our existing, well-developed quality system."

He adds that one of the most important aspects of ISO 3834 accreditation is its universal acceptability in the Southern African welding industry. "Although we have been working with a multitude of blue-chip clients for many years who have obviously been satisfied with the quality of our products and

providers, ND Engineering's overwhelming strength is its highly skilled and experienced team. "From inception nearly 40 years ago this company has endeavoured to keep its workforce stable and, most importantly, continuously trained to the highest possible standards," says Green. "We have never relied on contract labour preferring to standardise and make consistent our skills. This is a distinct advantage for our clients who can now rely on crews whose core has an average of over 20 years' experience in our specialist fields."

Green says that one of the secrets of ND's success has been paying special attention to all stakeholders in the business. "We have built



Receiving the certificates are (front row l-r) Mark Ackerman (General Manager), Sean Blake (SAIW), Elvis Green (Managing Director) and John Creamer (QA Manager).

service, ISO 3834 accreditation is an objective confirmation to our clients that they are receiving the best possible quality from us based on international standards," says Green.

ISO 3834 certification, known in South Africa as the SAIW Welding Fabricator Certification Scheme, is operated by SAIW Certification, the certification division of SAIW, which is authorised to operate by the International Institute of Welding (IIW). SAIW Certification was the first organisation outside Europe to receive such authorisation.

Sean Blake, SAIW GM operations, says that the number of companies applying for and getting ISO 3834 accreditation continues to grow in South Africa. "This is an excellent thing as compliance with ISO 3834 ensures that our fabricators are working to the best possible standards," Blake says. "It also makes the process of choosing suppliers that much easier for the large end users." Founded in 1975, ND Engineering is one of South Africa's success stories. Focusing on the fabrication of proprietary equipment for international and local technology

and developed a culture of excellence, driven by leadership and a whole hearted buy-in of all employees, suppliers and customers. We have always gone the extra mile to ensure our professionalism and ISO 3834 accreditation is an example of this."

ND Engineering operates in the Paper and Pulp, Mining, Petrochemical, Chemical and Sugar industries and manufactures a wide range of products including: Heat Exchangers, Reactor Vessels, Evaporators, Pressure Vessels, Cyclones and Separators, Spray Dryers, Bulk Storage Vessels, Acid Plant Equipment and more.

Green reports that the entire accreditation process went very smoothly. "I must compliment the SAIW team. They were very professional and were there for us at every turn," he concluded.

FOR MORE INFORMATION ON ISO 3834 CERTIFICATION PLEASE CONTACT SHELTON ZICHAWO ON 011 298 2100 OR GO TO www.saiw.co.za

Globally significant appointment for SAIW's Executive Director

In the recent Annual Assembly of the International Institute of Welding (IIW), which was held in Seoul in Korea, Jim Guild, the Executive Director of SAIW, was appointed Chairman of IIW's International Authorisation Board (IAB). He is the first chairman of the IAB from outside Europe and the USA.

IIW is the leading global authority on welding with 67 member countries including just about all the developed and developing countries. Virtually all the countries of Europe, all of North America, leading Middle East and Asian countries including China and India, leading economic African and South American countries are active members of IIW.

The member countries interact to share the results of research and development their experiences in the application of welding and to harmonise training, qualification and certification of welding personnel. The vast majority of IIW members participate in the IAB which is IIW's body for developing and harmonising personnel training and certification activities as well as for managing the IIW system for certification of company welding quality systems. The IAB was founded in 1998.

Guild says that the IIW company certification system is already well entrenched in the South African welding fabrication industry with around 80 companies now having certified quality systems based on the ISO 3834 standard.

GUILD VIEWS HIS APPOINTMENT AS CHAIRMAN OF THE IAB AS A REFLECTION OF THE GOOD STANDING WHICH SOUTH AFRICA AND THE SAIW HAVE IN THE INTERNATIONAL WELDING COMMUNITY.

"The IAB training systems cover all categories of personnel involved in coordination of welding (engineers, technologists, specialists, practitioners), quality control (inspectors) and welders," Guild says.

SAIW's membership of IIW extends back to 1948 and it became a member of IAB in 2002. Guild explains that IIW has a training system developed by the best experts in the world and South Africa had to join as part of the the process to meet these standards. "In a world that is constantly getting smaller we use international codes and standards to build our equipment and plants. These codes and standards require that the people designing, fabricating and testing welded constructions are competent to do the work involved," he says

Guild adds that with this in mind, the IAB works to develop guidelines for welding personnel which include a training syllabus and examination and certification requirements. "The IIW qualifications are increasingly being used as references in ISO standards," Guild says.

Generally the IIW qualifications are already well known and used by South African industry. Two universities, Wits and the University of Pretoria, are presenting the engineer and technologist courses which lead to the IWE and IWT qualifications and there is now a healthy number of welding engineers and technologists qualifying and feeding into industry. The SAIW is filling the middle ground of training technologists, specialists, inspectors and practitioners in good numbers.



Jim Guild: SAIW Executive Director

Guild says that it is in the area of welders that there is a fantastic opportunity to make use of the IIW system. "The IIW International Welder programme provides an ideal balance of theoretical training with high practical skill levels. This has been picked up by Eskom and some other industry training initiatives. Over a period of six years Eskom is putting 600 young people through a comprehensive welder training programme which incorporates the IIW programme in a manner aligned with the National Qualification Framework (NQF) and the graduates leave with IIW qualifications," he says.

Guild adds that the challenge is to incorporate the IIW system into the government training programmes. "The International Welder programme should be included in the programmes for technical high school and further education colleges. This approach is increasingly being adopted elsewhere, with Sweden being an outstanding example of using industry standards as the cornerstone of government training programmes. The involvement of the national welding institute in the examinations and practical testing of candidates ensures that suitable skill standards are maintained by graduates," he says.

Guild acknowledges that SAIW tried unsuccessfully ten or more years ago to get the IIW programme incorporated into the NQF when outcomes based education and training were buzzwords. "Hopefully, times have changed," says Guild, "and we can only keep pegging away with the message that industry requires higher skill levels than those emerging from the current approach. I want to see South Africans in the jobs filled by imported welders but this won't happen until we get the skill levels right. What is needed is greater cooperation with industry and the SAIW is ready to support government programmes with its technical expertise."

Guild views his appointment as Chairman of the IAB as a reflection of the good standing which South Africa and the SAIW have in the international welding community.

Tongaat Hulett- Acucareira de Moçambique engages SAIW

The sugar industry is a heavy consumer of welding and welding technology and, according to SAIW Operations GM, Sean Blake, any successful plant and equipment management requires a good understanding of Metallurgy in general, and welding technology in particular.

“Metallurgy and welding technology in the sugar industry finds diverse application in construction of structures, vessels and equipment, preservation of equipment from various wear agents like impact, abrasion, corrosion, and repair and recovery of various steel vessels and equipment,” says Blake.

In order to raise the understanding of the technology, Tongaat Hulett-Acucareira de Moçambique engaged the Southern African Institute of Welding to present their popular “Appreciation of Welding for Engineers” 5-day course to a select group of 12 participants drawn from production and maintenance plant engineers as well as welding and fabrication technicians.

The course, which was run by SAIW’s Nico Fourie, and included a rich mix of theory and practical work, was held from 5-9 May 2014. “The vertical and horizontal mix of the participants enriched the presentation of the course, as the novices benefitted from the experienced and the experienced learned from the more basic questions of the novices,” Fourie says.

He added that it was altogether a unique experience to have worked both at the sugar mill and in Mozambique. “To the best of my knowledge this was a first for SAIW for both. There were things I had to get used to – like a siesta in the middle of the day – but overall the productivity and enthusiasm of the participants were high. They were all very keen to learn in spite of the pressures of doing the course in the midst of an operating plant.”

According to course organiser, Acucareira de Moçambique’s Evans Mautsahuku, both the content and delivery of the course were outstanding making for an extremely valuable exercise for the participants and the company as a whole.

FOR MORE INFORMATION CONTACT SEAN BLAKE ON 011 298 2100.



Some of the participants in the Appreciation of Welders for Engineers course at Tongaat Hulett-Acucareira de Moçambique

Young Welder 2015 Sponsors



Please note that at the time of printing not all logos were available.

Pressure equipment regulations and guidance notes to the regulations

In the last edition of Fusion we discussed the role of quality system certification in manufacturing in accordance with the PER and SANS 347. For the next few articles we will address the guidance notes that support the pressure equipment regulations. These guidance notes are intended to help, users, manufacturers, approved inspection authorities, and importers of pressure equipment to understand the content of the regulations and assist with the interpretation and implementation. They cannot substitute the regulations!

The first edition of the Guidance Notes was issued on 3rd February 2012 in Govt. Notice No. R 79. Subsequently Revision 1 was completed in the third quarter of last year. Revision 1 has not yet been printed but has been endorsed by the Department of Labour and was communicated by DoL in workshops around the country towards the end of last year. The published Guidance Notes take the form of the full text of the regulations with guidance being given as footnotes at the end of each regulation. In our articles we will focus on the most significant changes and/or changes made in Revision 1.

Regulation 5 - Duties of importers and suppliers

- (1) Importers and suppliers shall ensure that pressure equipment sold complies with the requirements of this Regulation.
- (2) The importer shall assume the liability of the manufacturer in terms of this Regulation.
- (3) Any pressure equipment that requires a permit to be issued by an organisation approved by the chief inspector shall ensure that such approval is obtained by the importer or manufacturer before the pressure equipment is placed in the market: Provided that such equipment shall comply with the relevant health and safety standard incorporated into these Regulation under section 44 of the Act.

Notes:

- (a) *The importer is the entity which imports pressure equipment for use and/or re-sale in South Africa. The importer must be a juristic person in RSA.*
- (b) *The importer of pressure equipment into the RSA assumes the liability of the manufacturer and must declare conformance to the PER. This conformity assessment review shall be countersigned by an AIA as applicable. The AIA shall only verify conformity assessment reviews for imported pressure vessels, steam generators and assemblies for category 2 equipment and higher.*
- (c) *Category 1 equipment and below does not require conformity assessment review by the AIA.*
- (d) *Where users or their agents appoint entities to manage procurement and construction of imported pressure equipment, this entity is in overall control and is deemed the importer.*
- (e) *The permit referenced in PER 5(3) is applicable to fire extinguishers in accordance with SANS 1475.*
- (f) *Importer shall verify that the foreign inspection bodies meets the requirements of PER 7(3)(b) with respect to ISO 17020 accreditation and scope of accreditation together with the applicable health and safety standard.*
- (g) *Series produced pressure equipment with type test certification and a declaration of conformity by the manufacturer may be*

conformity assessed by the importer and verified by an AIA where applicable using a once off conformity assessment review certificate for that type provided the manufacturer and notified body and the country of origin remains the same.

- (h) *Imported pressure vessels, safety accessories and pressure accessories in steam service need not be re-categorized in accordance with SANS 347 Fluid Group 1.*
- (i) *Reasonable steps required from the Importer to fulfil his liability as the manufacturer are:*
 - (i) *The Importer is obligated to perform a conformity assessment review in accordance with SANS 347 and with a verification signature by the Importer appointed Approved Inspection Authority (AIA) as applicable.*
 - (ii) *The Importer shall ensure that the equipment has been categorized and submitted to the applicable conformance assessments of SANS 347 or Pressure Equipment Directive as applicable (see sub-regulation 3.(3)).*
 - (iii) *The Manufacturer is obliged to ensure that the pressure equipment has been constructed in full accordance with a relevant health and safety standard (see sub-regulation (4.(1)) with the Importer only required to verify that the health and safety standard used by the Manufacturer for construction is listed in SANS 347.*
 - (iv) *The pressure equipment is provided with a certificate of manufacture which reflect the verification signature of an approved inspection authority (AIA), Authorized Inspector (AI) or Notified Body (NB) when so required (see sub-regulation 4.(3)).*
 - (v) *Ensuring that the approved inspection authority (AIA), Authorized Inspector (AI) or Notified Body (NB) meets the requirements stipulated in sub-regulation 7 and guide note (c) .*
 - (vi) *The pressure equipment marking satisfies the requirements of sub-regulation 9 through the addition of an additional data plate by the Importer if required.*
 - (vii) *Pressure equipment and/or assemblies are fitted with the required safety accessories as required by sub-regulation 10.*
 - (viii) *The Importer shall ensure that the provided documentation accompanying the imported equipment satisfies the requirements of sub-regulation 14. In the case of assemblies the Importer shall ensure that a global conformity assessment review certificate accompanies the assembly*
 - (ix) *Confirming that the pressure equipment is in full compliance, but not limited to, the applicable PER requirements.*

NOTE: Red text indicates changes and/or additions to the original Notes.

NB: SAIW publishes the above information in good faith but no liability arises from use of the information provided. Readers are encouraged to obtain and use the official Pressure Equipment Regulations and Guidance Note documents.

In the SPOTLIGHT



David Baird

IN OUR SERIES OF PROFILES ON PEOPLE WHO ARE MAKING A DIFFERENCE TO THEIR COMPANIES AND TO THE WELDING INDUSTRY GENERALLY, WE TALK TO DAVID BAIRD, MANAGING MEMBER OF CAPE WELDING DISTRIBUTORS, WHICH HE STARTED IN 1975. DAVID, WHO HAD A STINT AS BRANCH CHAIRMAN OF THE CAPE TOWN BRANCH OF THE SAIW HAS BEEN IN THE WELDING INDUSTRY FOR 40 YEARS.

Fusion: *How did Cape Welding Distributors come into being?*

DB: I always knew that by the age of 40 I needed to be an employee of the company from which I would retire. In 1995, the year I turned 40, with the then uncertainty of the new South Africa, I was placed in a position that necessitated me starting on my own and Cape Welding Distributors was born.

Fusion: *How has business been generally?*

DB: Overall it's been a wonderful experience. We have had our difficult times, which we overcame with hard work and support from our faithful suppliers and loyal customers, whom I must sincerely thank.

Fusion: *What about the future of CWD?*

DB: I see the future of Cape Welding Distributors as one of continued growth. We will continue to help improve the skills of our team and to offer more specialist offerings to our customers and distributors as our product range continues to grow. Whilst we do sell a full range of products, we have specialised more, focusing on Silver and Copper Brazing Alloys, Stainless Steel Electrodes as well as Mig and Tig wires. We also import the Antox range of pickling pastes.

Fusion: *What about the local welding industry?*

DB: I think that for many years the welding industry was in decline to the extent that we no longer produced artisans but operators. Fortunately this is being reversed by organisations like the SAIW, which have recognised the need for properly educated and trained welders and, together with local colleges, have developed and implemented programmes that provide the industry with properly qualified welders. In addition, fabricators are adding quality certifications to their resumés thus creating a demand for properly coded welders. The welding industry is definitely on the up and this is likely to continue into the future.

Fusion: *And in Cape Town?*

DB: The SAIW has had a strong presence in Cape Town for many years but with the opening of their own offices in Milnerton they will have a greater impact on welding in the Cape. This can only be a win-win situation for Cape Town based fabricators and the welding industry as a whole in this province.

Fusion: *How long have you been in the industry and what have you liked most about it?*

DB: I have worked in the welding industry - except for one year in paint - since I left school in 1974. For me the enjoyment has come from the fact that no two days are ever the same. The diversity of welding and fabrication brings with it different applications and challenges. I enjoy meeting new people and helping them out irrespective of whether or not it leads to an order. We take pride in the fact that so many of our customers are referrals. As a company, we also find ourselves dealing with health related issues as European legislation changes and companies involved in the international market are asked to comply. Examples of this are replacing Thoriated Tungsten electrodes and Cadmium bearing brazing alloys.

Fusion: *And finally a bit about your personal history?*

DB: I was born in Glasgow, Scotland in 1955 and arrived in South Africa by way of Malta in 1968. My father was in ship repairing. He came to Cape Town as one of the founding staff members of what was then called Dorman Long Swan Hunter. I matriculated at Pinelands High School in 1974 and joined Afrox in 1975. Whilst I have no tertiary education I have completed a number of work related training courses as well as a Diploma in Business Management. I consider myself to have a QBE (Qualified by Experience) from the University of Life!

I married Colleen in 1980. We have 2 children, David and Samantha and one grandson, Damian. Colleen and I like to travel - mainly in this wonderful country of ours which offers so much. I love living in Cape Town - there is nothing as comforting as that first glimpse of Table Mountain when you are returning from a trip.

JOB KNOWLEDGE 114 – Part 1

Heat treatment of welded joints

Heat treatment is an operation that is both time consuming and costly. It can affect the strength and toughness of a welded joint, its corrosion resistance and the level of residual stress but is also a mandatory operation specified in many application codes and standards. In addition it is an essential variable in welding procedure qualification specifications.

Before discussing the range of heat treatments that a metal may be subjected to, there is a need to clearly define what is meant by the various terms used to describe the range of heat treatments that may be applied to a welded joint. Such terms are often used incorrectly, particularly by non-specialists; for a metallurgist they have very precise meanings.

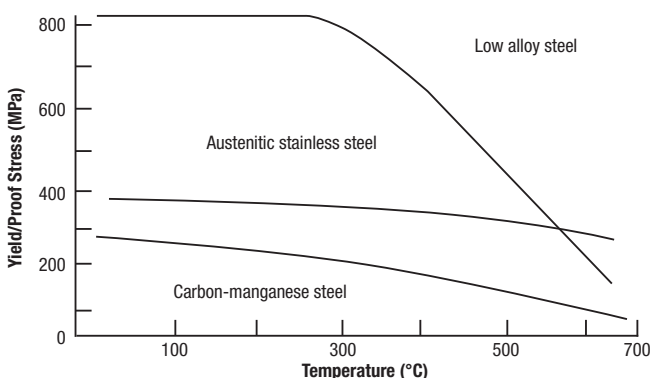


Fig. 1 Heat treatment of welded joints

Solution treatment

Carried out at a high temperature and designed to take into a solution elements and compounds which are then retained in solution by cooling rapidly from the solution treatment temperature. This may be done to reduce the strength of the joint or to improve its corrosion resistance. With certain alloys it may be followed by a lower temperature heat treatment to reform the precipitates in a controlled manner (age or precipitation hardening).

Annealing

This consists of heating a metal to a high temperature, where recrystallisation and/or a phase transformation take place, and then cooling slowly, often in the heat treatment furnace. This is often carried out to soften the metal after it has been hardened, for example by cold working; a full anneal giving the very softest of microstructures. It also results in a reduction in both the yield and the tensile strength and, in the case of ferritic steels, usually a reduction in toughness.

Normalising

This is a heat treatment that is carried out only on ferritic steels. It comprises heating the steel to some 30-50°C above the upper transformation temperature (for a 0.20% carbon steel this would be around 910°C) and cooling in still air. This results in a reduction in grain size and improvements in both strength and toughness.

Quenching

This comprises a rapid cool from a high temperature. A ferritic steel would be heated to above the upper transformation temperature and quenched in water, oil or air blast to produce a very high strength, fine grained martensite. Steels are never used in the quenched condition, they are always tempered following the quenching operation.

Tempering

A heat treatment carried out on ferritic steels at a relatively low temperature, below the lower transformation temperature; in a conventional structural carbon steel this would be in the region of 600-650°C. It reduces hardness, lowers the tensile strength and improves ductility and toughness. Most normalised steels are tempered before welding, all quenched steels are used in the quenched and tempered condition.

Ageing or Precipitation hardening

A low temperature heat treatment designed to produce the correct size and distribution of precipitates, thereby increasing the yield and tensile strength. It is generally preceded by a solution heat treatment. For steel, the temperature may be somewhere between 450-740 degree C, an aluminium alloy would be aged at between 100-200°C. Longer times and/or higher temperatures result in an increase in size of the precipitate and a reduction in both hardness and strength.

Stress relief

As the name suggests, this is a heat treatment designed to reduce the residual stresses produced by weld shrinkage. It relies upon the fact that, as the temperature of the metal is raised, the yield strength decreases, allowing the residual stresses to be redistributed by creep of the weld and parent metal. Cooling from the stress relief temperature is controlled in order that no harmful thermal gradients can occur.

Post heat

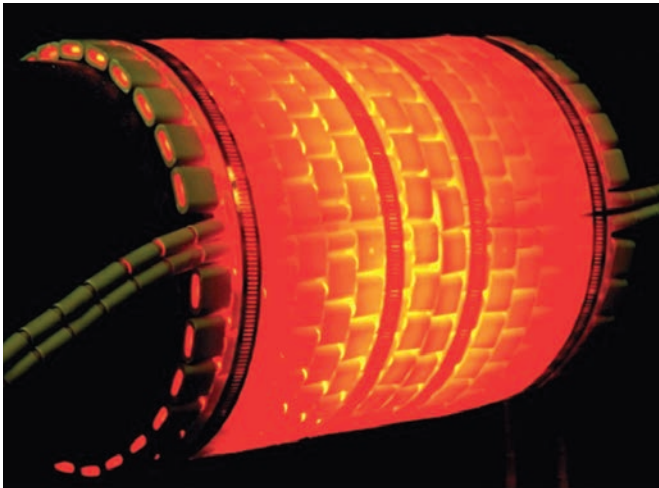
A low temperature heat treatment carried out immediately on completion of welding by increasing the preheat by some 100°C and maintaining this temperature for 3 or 4 hours. This assists the diffusion of any hydrogen in the weld or heat affected zones out of the joint and reduces the risk of hydrogen induced cold cracking. It is used only on ferritic steels, where hydrogen cold cracking is a major concern i.e. very crack sensitive steels, very thick joints etc.

Post Weld Heat Treatment (PWHT)

So what does the term 'post weld heat treatment' mean? To some engineers it is a rather vague term that is used to describe any heat treatment that is carried out when welding is complete. To others however, particularly those working in accordance with the pressure vessel codes such as BS PD 5500, EN 13445 or ASME VIII, it has a very precise meaning. When an engineer talks of post weld heat treatment, annealing, tempering or stress relief it is therefore advisable.

Heat treatment following welding may be carried out for one or more of three fundamental reasons:

- to achieve dimensional stability in order to maintain tolerances during machining operations or during shake-down in service.
- to produce specific metallurgical structures in order to achieve the required mechanical properties.
- to reduce the risk of in-service problems such as stress corrosion or brittle fracture by reducing the residual stress in the welded component.



The range of heat treatments to achieve one or more of these three objectives in the range of ferrous and non-ferrous metals and alloys that may be welded is obviously far too extensive to cover in great detail within these brief Job Knowledge articles. The emphasis in the following section will be on the PWHT of carbon and low alloy steels as required by the application standards although brief mention will be made of other forms of heat treatment that the welding engineer may encounter in the ferrous alloys. There are two basic mechanisms that are involved, firstly stress relief and secondly microstructural modifications or tempering.

Stress Relief

Why is it necessary to perform stress relief? It is an expensive operation requiring part or all of the welded item to be heated to a high temperature and it may cause undesirable metallurgical changes in some alloys. As mentioned above there may be one or more reasons. The high residual stresses locked into a welded joint may cause deformation outside acceptable dimensions to occur when the item is machined or when it enters service. High residual stresses in carbon and low alloy steels can increase the risk of brittle fracture by providing a driving force for crack propagation. Residual stresses will cause stress corrosion cracking to occur in the correct environment eg carbon

and low alloy steels in caustic service or stainless steel exposed to chlorides.

What causes these high residual stresses? Welding involves the deposition of molten metal between two essentially cold parent metal faces. As the joint cools the weld metal contracts but is restrained by the cold metal on either side; the residual stress in the joint therefore increases as the temperature falls. When the stress has reached a sufficiently high value (the yield point or proof strength at that temperature) the metal plastically deforms by means of a creep mechanism so that the stress in the joint matches the yield strength. As the temperature continues to fall the yield strength increases, impeding deformation, so that at ambient temperature the residual stress is often equal to the proof strength (Fig 1).

To reduce this high level of residual stress, the component is reheated to a sufficiently high temperature. As the temperature is increased the proof strength falls, allowing deformation to occur and residual stress to decrease until an acceptable level is reached. The component would be held at this temperature (soaked) for a period of time until a stable condition is reached and then cooled back to room temperature. The residual stress remaining in the joint is equal to the proof strength at the soak temperature.

Figure 1 shows that residual stress in a carbon manganese steel falls reasonably steadily from ambient to around 600 degree C but that the high strength creep resistant steels need to be above 400 degree C before the residual stress begins to fall. Stainless steel is hardly affected until the temperature exceeds 500 degree C. There is therefore a range of soak temperatures for the various alloys to achieve an acceptable reduction in residual stress without adversely affecting the mechanical properties of the joint. In carbon manganese steels this temperature will be between 550-620 degree C, in creep resistant steels somewhere between 650-750 degree C and for stainless steels between 800-850 degree C.

The next article will cover tempering of ferritic steels and will be followed by further information on other alloys and methods of applying and controlling heat treatment activities.

Young Welder 2015 launched

Continued from page 1

But we also plan to use the social media like Facebook, Twitter and others, which are appropriate for the age-group of the participants in the Young Welder competition. We will also be making a special video CD of the competition, which will be used as a promotional tool," says Blake.

All young welders in South Africa, who will not be more than 22 years of age on December 31, 2014, are invited to enter the competition. Entrants will have to show that they have mastered four welding processes – shielded metal arc welding (SMAW), gas tungsten arc welding (GTAW), gas metal arc welding (GMAW) and flux-cored arc welding (FCAW) – across the three materials or in their chosen material.

Entries close on the 20th October 2014

For more information please contact: Etienne Nell or Frans Vorster on 011 298 2100.

Please see sponsors logos on page 5.



A young welder during 2013 competition

Qualification and Certification

CONGRATULATIONS TO THE PEOPLE BELOW WHO RECENTLY ACHIEVED QUALIFICATION AND CERTIFICATION.



SAQCC-NDT CERTIFICATES	Ultrasonic Testing Level Three	Breet JD Cameron H Chauke AV Clarke AJ Combrink ZHK da Gama SPF de Beer GH Dennis P Deventer V du Toit Z Erentze JA Fillies B Ghambula JF Goniwe CL Hanekom R Harillal R Hendricks DA Henning JG Henry KT Heunes CS Hlophe LG Jansen R Jansen R Jooste BH Kajee S Khoba DM Khumalo NZ Kok J Kruger GF Louw JM Lukasa Kabonga PL Lukhele LM Mabela SD Mahlangu CJ Mahlangu H Mahlangu LJ Mahlangu SM Malefane ID Manue FI Marnitz BCA Mashiyane N Masithela TS Mnguni S Mochachoane AD Molebatsi TD	Moloko LP Mostert R Motseki FPT Msweli MS Muchemwa N Muller B Naidoo WA Nankomar RD Naude ES Ndaba AA Ndhlovu MS Nel A Nel FH Nguqu L Pakkies SA Pandor NS Pelser J Phahlamohlaka KS Piater PJ Pretorius JC Rademan MP Richards L Rowse M Sebela PG Shilakoe L Sibanyoni FK Smith DH Smith DP Smith KF Snyman A Stevens AC Taktikos NJ Tjale EM van Boom AB van Bosch DE van der Westhuizen JJ van der Westhuizen W van Jaarsveld A van Wyk JM van Zyl M Viljoen PF Visagie R Whelan WF	Inspectors Level Two Barlow BD Bezuidenhout PF Captain Hastibeer CM Cele MS Chutte CJ Coetzee N Coetzer PD de Costa R de Villiers N Forbay RD Geyer JF Greeff JJ Grobler JS Hamid R Kast ERM Khubeka L Kritzinger J Kupula MA Labuschagne CJ Lesch CJ Lucas RI Lynch LC Maartens R Mashinini N Mhlongo S Mhlotshane GJ Mkhwanazi BM Mokoana P Moodley T Naicker K Naude J Nipper K Olinsky L Pierce DM Ramoloko MS Scullard GM Shaikh AA Singh D Steynberg JL Tamanyane KW Tarentaal E Thomas QF van der Merwe Q	van Deventer CJ Vorstman J Walker NH Walters ED Young S Zwane LZ Zwane P
Liquid Penetrant Testing Level One Willard M	Ultrasonic Testing Wall Thickness Masango VN Thanjekwayo NP				
Liquid Penetrant Testing Level Two Mkhize WM					
Liquid Penetrant Testing Level Three le Roux GP	Radiographic Testing Level One Pienaar JP van Staden PH				
Magnetic Particle Testing Level One Madela TNM Matlala T Scharneck JB Setlhapelo K	Radiographic Testing Level Two None				
Magnetic Particle Testing Level Two Chamunorwa A	Radiographic Testing Level Three None				
Magnetic Particle Testing Level Three Chamunorwa A	Radiographic Interpreters None				
Ultrasonic Testing Level One Ledwaba KO Salt HH	STUDENTS THAT PASSED THE WELDING INSPECTORS LEVEL ONE & TWO				
Ultrasonic Testing Level Two van der Merwe L Smit M	Inspectors Level One Banoo J Bergoer RM Blaauw B Botes IJC Botha D				
				ASME CODES OF MANUFACTURE	
				Arjunan B Govender V Mahamba MJ Makoge DA Radebe RM Strydom JJ Strydom MP Stuart WS Thompson LW Tsolo PP van Wyk M Very MCJ Viviers A	
				Painting Inspectors None	
				CERTIFIED STUDENTS	
				Boilers None	
				Pressure Vessels de Jager D	
				IPE Lawler N	

Branch NEWS

Durban Golf Day a great success

The Durban Golf Day was, once again a great success and SAIW Executive Director, Jim Guild said that he is encouraged by the growth of participation and would like to see this event grow from strength to strength. (We are not sure this is because he played good golf and came second in the competition!) He paid tribute to Kim Stevens and Anne Meyer, SAIW Durban branch manager for the effort they put into the day and the excellent organisation. He also complimented the condition and layout of the Royal Durban course which he says is a perfect venue.



Winners of the Durban Golf Day from Babcock (L-R) Steven Vorster, Barry O'Connor, Dean Fisher and André Roets

Durban Certification Dinner



At the recent Durban certification dinner some 39 welding inspectors attended the graduation function where they received IIW and SAIW diplomas

Cape Town Branch opens its new premises

SAIW is increasing its presence in regions throughout South Africa recently opening a facility in Milnerton, Cape Town. Some 60 guests attended the official opening on 31 July. Morris Maroga, SAIW President, told the guests that the Institute's Cape Town Branch had been active for more than fifty years. There were some stalwart past and current branch committee members at the event and Maroga thanked them for their contribution to the Institute.

Daniel Silke, the well-known political and economic analyst, made a presentation on Africa Rising, highlighting the current and future growth prospects for the continent. Liz Berry, SAIW's Western Cape representative, reports that the facility, which is definitely increasing the interest in career opportunities in welding, has already hosted several courses including Welding Inspector, Senior Inspector, Appreciation of Welding for Engineers and AWS D1.1 Codes training.



(L-R) Jim Guild, Morris Maroga (SAIW President), Liz Berry and Daniel Silke



Branch NEWS

Cape Town

Although our official Branch Opening only took place on the 31st July 2014, the branch had already hosted Welding Inspector, Senior Inspector, Appreciation of Welding for Engineers and AWS D1.1 Codes training.

We have also held two very well-attended Evening Meetings. On the 18th June, Nico Fourie of the SAIW gave a presentation on the importance of pre-heating, and on the 1st July – although initially flagged as a demonstration & site-visit to Metal Allsorts in Montague Gardens – due to strike action in the area, we hosted Reda Naili of Hypertherm (Holland), who gave a presentation on plasma cutting.

Forthcoming training courses:

- RT Interpreters (2 weeks)
15th – 27th September
- ASME Codes of Construction for the Inspection of Pressure Vessels & Steam Generators
13th – 24th October
- Welding Inspector (SAIW Level 1) – 5 weeks
20th – 31st October,
10th – 21st November &
1st – 5th December
- Competent Persons – Steam Generators
1st – 12th December
- Appreciation of Welding for Engineers
3rd – 7th November
- Competent Persons – Pressure Vessels
24th – 28th November

Should there be any suggestions for evening meetings, for further information on forthcoming events or to be added to the Cape Town SAIW mailing list, please contact Liz Berry (berryl@saiw.co.za) or Tel: 021 555 2535 Fax: 021 555 2517

Johannesburg

On the 25th of June 2014, Eli Dayan (NDT Specialist from Vidisco – Israel) presented the evening meeting entitled “Digital Radiography – High quality imaging with DDA’s (Digital Detector Array)”.

Digital Radiography (sometimes referred to as Direct Radiography or DR) has made a quantum leap in the last decade and is rapidly being adopted into the world of NDT.

The benefits of Direct Radiography are enormous. It offers productivity benefits that include substantial reductions in exposure time, elimination of film waste, enhancement in image quality and analysis and improvement in data management. Images can also now be stored digitally and transmission of the image is easy with existing technologies.

Images can be immediately acquired and subsequently sent to the other side of the globe in a matter of minutes. The images are no longer held in a single location and can be analysed by consultants and technicians who are many miles away from the job-site.

The presentation showed the essentials required for high quality imaging with a Digital Detector Array along with practical examples.

New Corporate Members:

Inkunzi Engineering & Services CC
Crest Information Systems

New Personal Members:

Nwokocha C
Pandor NS
Hendriks DA

HR NEWS



We welcome Theresia van Zyl who has joined us as an SAIW TRAINING administrator. She will focus on Inspector Level 2 and ASME admin and will assist in the admin of re-writes and examinations. We wish her good luck and a long and happy career at SAIW.

Durban

Durban is growing from strength to strength! We had a very successful RT Interpreters..... Course and another one is scheduled for November. Due to popular demand, an extra QC Level 1 course was added to the Durban list, which starts on 21 July. This course was filled up within 3 weeks. Currently we are advertising and planning an NDT Wall Thickness course for October

Our June meeting was addressed by Hugo Vaughn from Head Office on “Radiographic Interpretation of films according to the ASME-Code”. Our monthly meetings are growing bigger and are well supported.

We also had a very successful Certification Dinner in May (see page 11).

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