# Technical Journal

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# As Chairman of the Pipeline Industries Guild, **I am delighted to introduce the second Technical Journal.**

We are incredibly lucky to have such a vast wealth of diverse skills and expertise in the pipeline industry and through the Technical Journal we are able to achieve one of The Guild's objectives of sharing this specialist information and innovations with our colleagues. Feedback from the first journal, which was published last year, was very positive and we strive to continue to provide you with articles you will find interesting and informative.

In this edition, we highlight four of the projects which won awards at the recent Annual Dinner. These prestigious awards recognise the very best in innovation and technology and the standard of entries this year was, as always exceptional. It is becoming harder to choose winners each year as the industry develops and advances.

I would like to thank and congratulate all winners and nominees both personally, and on behalf of The Guild, for your commitment and dedication.

I encourage all of our members to submit articles that they feel would be suitable to share in future editions. We love to hear news of ground-breaking projects, collaborations and new developments in the industry.

Best wishes
Norman

**A fully comprehensive guide to the awards, nominees and winners can be found at www.pipeguild.com/awards**

# Panel Information

**Below you will find contact details for each of the panel chairs.**

Please do feel free to contact them if you have any news, require any information or have any issues that you would like to discuss.

**Offshore Panel**
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**Utilities Panel**
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**International Panel**
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**Young Professionals Panel**
Contact: Gavin Ware
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**If you would like to submit an article to be considered for inclusion in the Technical Journal, please email pr@smartideasdesign.co.uk. Articles should be around 700 words, and up to 2 images can be included. All information should be technically sound although will be proofread for grammar and spelling.**

## Subsea Pipeline Technology Award

**Winner: MesoCoat Inc**

This award, introduced in 1992, is made annually for the most significant contribution to subsea pipeline technology. The objective is to promote the development of new ideas in the general field of subsea pipeline technology.

# Corrosion Resistant Alloys (CRA) - Clad Pipes for Oil and Gas industry, manufactured using High Density Infra-Red (HDIR) Fusion Cladding process

**Article submitted by Anoop Samant PhD and Andrew Sherman, MesoCoat Inc**
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Oil and gas risers and flowlines are exposed to severely corrosive environments, requiring the use of corrosion resistant alloys (CRAs). CRA clad carbon steel backing pipe offers a more economical alternative to the use of CRAs. Current processes for producing clad steels suffer from limitations and drawbacks, including less than optimal bond strength, and dimensional and wall thickness limitations, or low productivity in the case of laser and weld overlay processes. CermaClad™ is a high productivity fusion cladding process that offers a scalable alternative to laser and weld overlay for wear and corrosion resistant alloy cladding.

CermaClad™ technology utilizes a high density infrared (HDIR) thermal source, which is effectively an artificial sun captured in a reflector to rapidly fuse metal and cermet coatings on steel pipes, plates and bars producing metallurgically bonded claddings at overlay application rates approaching 500 lb./hr. per fusion lamp. These claddings and overlays have multiple applications in the upstream oil and gas industry such as steel risers, subsea flowlines, wet gas pipelines, hydrotransport lines, separators, valves, and spools.

The High Density Infra-Red (HDIR) cladding process uses light emitted from a plasma arc lamp which is concentrated into a line focus at 500-3500W/cm2 to fuse and bond a layer of metal such as Inconel 625, Inconel 825, stainless steel, to a structural backing metal such as X65 pipe. In the CermaClad™ process, a metal precursor powder is applied as a paint to the surface to be clad (such as seamless pipe), and then the surface is scanned with an arc lamp to fuse and metallurgically bond the cladding. The arc lamp (Figure 1a) produces an intense, indirect heat capable of heating a surface at rates exceeding 1,000,000 degrees/second, but without the electrode and Marangoni convective stirring effects of GMAW and laser welding processes, leading to lower weld dilution (higher purity overlays).

Under a cooperative agreement with Petrobras (NYSE: PBR), the design of the lamp was miniaturized and modified for cladding inside a pipe as small as 8" in diameter, and is represented in Figure 1b.

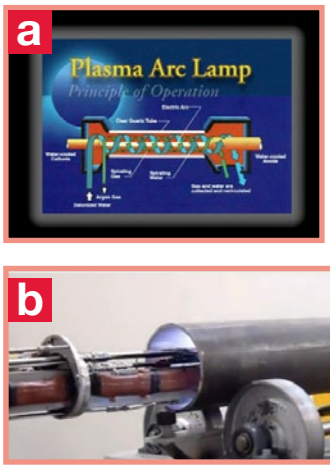


Fig. 1a) Operating principle (courtesy Vortek-Mattson industries) b) Setup for cladding inside a pipe

The value propositions of the CermaClad™ technology are: faster application rate (15 – 80 times faster than conventional laser/weld cladding processes), true metallurgical bond (bond strength > 75,000 psi), low overlay dilution with iron, ability to produce metallurgically bonded clad seamless pipe, and no limitations on pipe wall thickness or upper diameter. This technology is suitable for the production of stainless and CRA clad seamless and prefabricated pipes in diameters 8" to 36", and with wall thicknesses from 0.25" to 2" and higher. Both CRA and wear resistant alloys such as chrome carbide and WC Metal matrix composite overlays can be applied

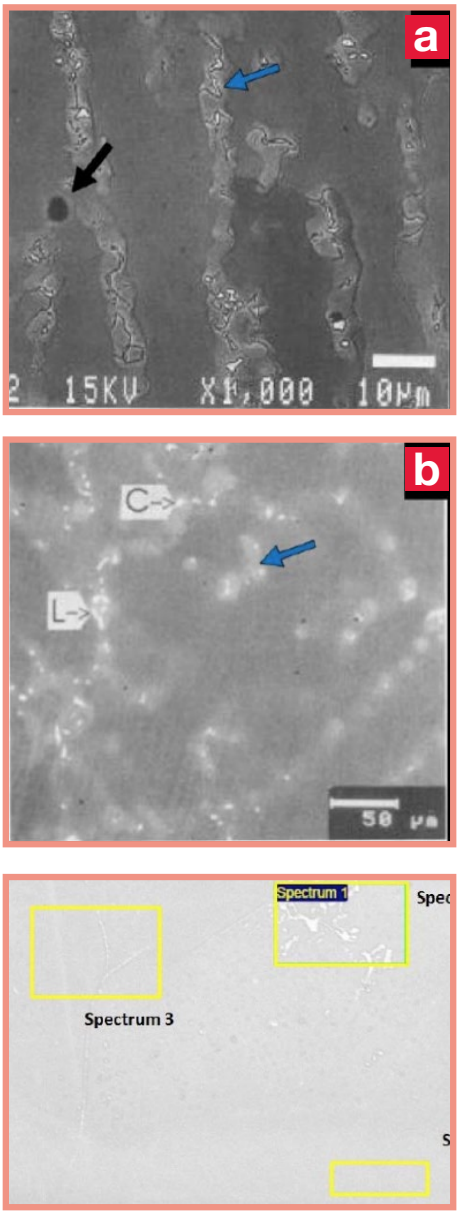


Figure 2. Optical photomicrographs of weld overlay (a), wrought (b), and CermaClad™ (c) alloy 625

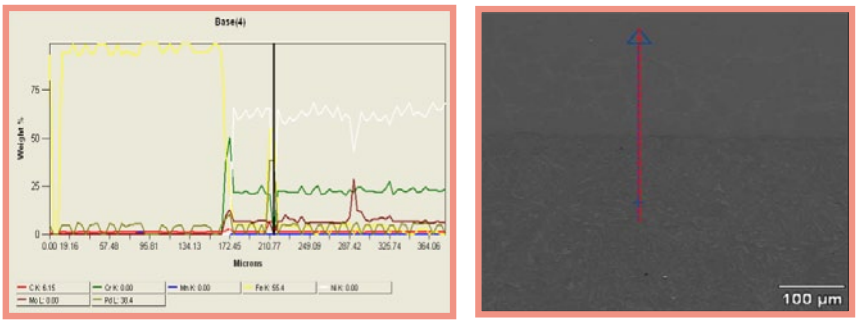


Figure 3. EDX line scan showing Fe, Cr, Ni, and Mo contents of fused alloy 625 overlay, and lack of iron dilution in overlay.

The reduced iron dilution, and fast cooling rates of the 625 alloy overlays resulted in higher corrosion pitting resistance compared to weld overlay, approaching annealed wrought alloy. Typically, CermaClad-625 samples have G28 corrosion rates roughly 50-70% lower than comparable weld overlay, and well below acceptable American Petroleum Institute API 5LD requirements.

Metallurgical bonding was observed both through inter-diffusion zones (figure 3), as well as through shear testing, where bond shear strengths consistently above 30,000 psi are observed, with measured values ranging from 31,475-32,480 psi shear strength. This is comparative to the shear strength of the base X65 pipe, and is 50% higher than API5LD requirements.

CermaClad high-speed large-area fusion cladding process has the potential of meeting future clad pipe demand and local content requirements; as the process is up to 40x faster than the conventional weld and laser metallurgical cladding processes, offers superior metallurgical properties with a seamless product, and is highly cost competitive having low fixed, variable, and capital costs compared to alternate production methods. The speed of this process and resulting productivity of the equipment enables flexible supply, the lowest capital cost per unit production, and small process and labour footprint for reduced costs.

## Utility Pipeline Technology Award

**Winner: JD7**

This award, introduced in 2003, is made for the most significant contribution to utility pipeline technology. The objective is to promote the development of new ideas in the general field of utility pipeline technology.

# JD7 Pipescan+ - a new generation survey tool

**Article submitted by Daniel Krywyj**
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JD7 Pipescan+ is a new generation survey tool and a major departure from traditional internal pipe inspection systems, providing a detailed structural condition assessment of smaller diameter mains, in addition to the established visual and acoustic capability. The pipe condition capability is provided by ultrasonic transducers that rotate to provide 360-degree pipework scanning at pre-determined intervals. This data enables pipe condition and pipe life expectancy to be assessed, as well as profiling the geometry and features of both internal and external surfaces.

The miniature size and configuration is designed for insertion directly into live mains from purpose made housing via a Through Bore Hydrant (TBH) located directly on top of the main, avoiding any requirement for isolation and interruption of supply. Movement is provided through a 100 metre umbilical cable operated by an electronic drive mechanism through a seal and disinfection arrangement.

For the first time, TBHs have been installed on live operational water distribution mains, using the first prototype under pressure drilling unit that is mounted onto the TBH. This innovative approach has been prompted by the need to provide information that allows informed and accurate decision making when allocating capital expenditure to pipe replacement or rehabilitation programmes.

Understanding the condition of underground assets has been a long-term issue for water companies and the challenge of delivering 'value for money' makes cost beneficial investment more important than ever. Pipescan+ provides water companies with comprehensive, previously unobtainable, data to optimise their pipe replacement programmes.

Over the years, numerous 'leakage detection technologies' have been developed. Generally, these systems are remotely applied but the limitations of many of these technologies has meant that leakage remains a major issue in the water sector. JD7 Pipescan+ does not rely on remote application - the system's acoustic capability is inside the pipe and its ability to locate leakage with pinpoint accuracy increases the 'hit' rate for effective detection and repair.

The combined structural NDT/hydrophone/CCTV/sonde Pipescan+ micro unit also enables access to smaller distribution diameters that typically account for 85% of a water network. Furthermore, these surveys can be undertaken with the mains under pressure and without interrupting water supplies.

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