CANWELD CONFERENCE 2022

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AUTOMOTIVE WELDING

TORONTO CONGRESS CENTRE - JUNE 15 - 16TH, 2022

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AUTOMOTIVE **WELDING**

KEY CWB ASSOCIATION PRIORITIES

1. **Provide the welding community with networking opportunities, share best practices, innovations and advancements that support industry success in virtual, hybrid, and face-to-face forums**
2. **Increase the value of membership on our mission to be the best professional association in Canada.**

The CWB Association and its volunteer members work hard on behalf of the welding industry at local, regional, and national levels to ensure the prosperity and sustainability of the Canadian welding industry. Since its beginning over 100 years ago, the CWB Association has worked diligently with the industry to create more opportunities for its members and help support and advocate for those within the trades.

We promote welding careers through our engagement with school boards, participation at trade fairs, social media, guest speaking engagements, plant tours, mentorships, electronic and print publications, podcasts, YouTube, and any we can find!

We initiate and participate in government dialogues, policy development, and legislation to promote the success of the Canadian welding industry. We actively engage with a variety of associations, groups, and government agencies to make investments and contributions to our labour force to ensure that the Canadian industry has an adequate supply of skilled labour for its current and future needs. We work closely with industry suppliers and academia to provide Canadian employers with timely access to innovative welding technologies and advanced research information.

We encourage the industry to make investments in welding education that will lead to improved welding productivity and competitiveness in the welding and metal fabrication industry.

Our regional Chapters organize educational, interactive, and exciting events for members to attend and participate in. On a broader scale, the CWB Association organizes annual conferences and events, such as CanWeld, Weld Industry Days, National Trivia Night, and the Welding Educator conference. These provide learning and networking opportunities for welding educators and industry professionals.

Most importantly, the CWB Association is always looking for new and innovative ways to connect and invest in its membership. Connecting industry, educators, and our workers will help us develop programs that ensure the success, prosperity, and sustainability of the Canadian welding industry.

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MESSAGE FROM THE PRESIDENT & CEO

DOUG LUCIANI

President & CEO
CWB Group

WELCOME TO CANWELD 2022

After years of virtual events, the CWB Group couldn't be more excited for CanWeld in conjunction with Fabtech Canada. Designed to provide a convenient venue for meeting with world-class suppliers, seeing the latest industry products and developments, and discovering new solutions to metal forming, fabricating, welding and finishing requirements, Fabtech Canada is your one-stop shop for all things metal.

Spanning over three days, CanWeld and Fabtech Canada will put you face-to-face with more companies, people, technologies and industries than you could ever imagine. That is one of the reasons that the CWB Group is delighted to partner with Fabtech Canada because after a difficult few years, this is just the type of excitement the welding industry needs.

This year's theme of Automotive Welding will increase visibility for the manufacturing heartland region while highlighting the automotive, steelmaking and metal fabrication industries. With having to adjust to the constantly changing landscape over the past two years, the CWB Group is thrilled to be able to reconnect and re-establish with our members and clients again. As always, we promise some meaningful conversations around the automotive sector with knowledgeable speakers and guests that can't wait to share their insights with you. I would also like to take this opportunity to thank you for your continued support and loyalty even in the darkest of times. We can't wait to see you face to face and catch up on all that we've missed.

Thank you for attending, and we look forward to connecting with each of you.

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MESSAGE FROM THE DIRECTOR OF CWB ASSOCIATION

MAX CERON

Director,
CWB Association

WELCOME TO CANWELD 2022

We're so excited to welcome you to the 12th annual CanWeld conference in Toronto, the capital city of Ontario. Toronto has always been a center of business and activity known around the world for its vitality, innovation, arts, and beautiful green spaces. Let's not forget the sports teams, like the Raptors, Blue Jays, Argonauts, Toronto FC, and the Maple Leafs !

This year's theme is Automotive Welding and Automation, and we hope that by bringing in the best of the best from the industry together for our first in-person conference since the pandemic we can start the process of healing and growing our industry needs.

This year, we also will be sharing our space with FABTECH Canada! By working in collaboration with FABTECH we hope to create a unique and vibrant offering for all our attendees. Something new and unforgettable.

Our goal is to host a knowledge-based conference with presentations on practical applications of diverse welding technologies, inspection, standards, and safety accompanied by welding research presentations. We are also ensuring that we create awareness for gender diversity and BIPOC groups with our programming, keynotes, panels, and speakers.

This year will feature many practical application presentations and provide our audience with many networking opportunities from an extensive range of industry participants such as educators, students, decision-makers, influencers, suppliers, and consultants. We will have new sponsors, new companies, new faces, and new innovations to share with all of you.

Come see all that the conference has to offer and network with key players in the welding industry!

CWB | cwbassociation

AUTOMOTIVE WELDING

CANWELD 2022 TORONTO CONGRESS CENTRE

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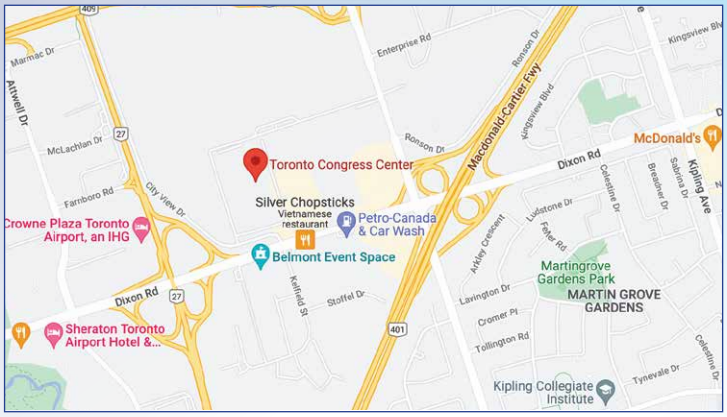


DATES

Day 1: Wednesday, June 15th,
7:30 am - 3:40 pm EST

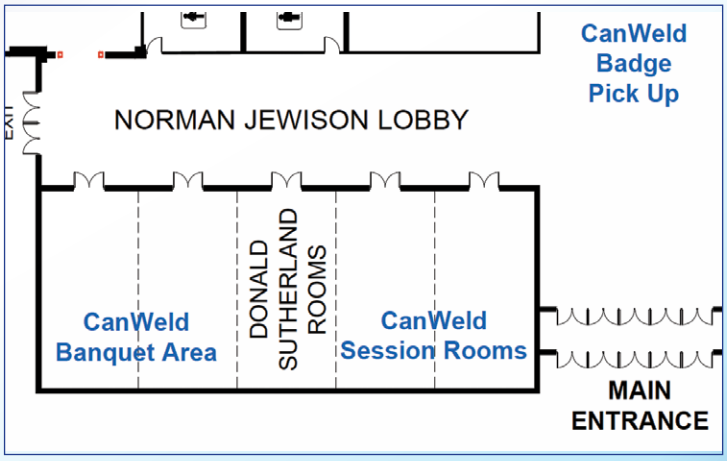
Day 2: Thursday, June 16th,
8:00 am - 4:00 pm EST

NETWORKING EVENTS

June 14th, 6:00-7:00 pm CanWeld Cocktail Hour | Delta hotel, Terrance Reception Room
June 15th, 6:30-10:00 pm CanWeld Awards Dinner | Delta hotel, International C Reception Room

DRESS CODE

Conference- Casual or Business Casual
Awards dinner- Business Casual



AUTOMOTIVE **WELDING**

OVERVIEW OF THE SCHEDULE - CANWELD 2022

DAY 1: WEDNESDAY, JUNE 15, 2022

7:30-8:15	Breakfast and Opening Remarks : Max Ceron- CWB Association | Room: Sutherland 3-5					
8:15-8:50	The Mechanics of GMAW Arc : Emanuel Santos- University of Waterloo | Room: Sutherland 3-5					
	Room: Sutherland 1			Room: Sutherland 2		
	Presenter	Affiliation	Presentation Title	Presenter	Affiliation	Presentation Title
9:00-9:30	Ken Mui	Lincoln Electric Company	Filler Metal Certification Testing Compared to Production Welds	Mitchell Grams	Apollo-Clad Laser Cladding	Effect of Relative Dimensions for Weld Pool and Powder Cloud on Laser Cladding Catchment Efficiency
9:40-10:10	Mahyar Asadi	Novarc Technologies	An Industrial Journey from Welding Vision to Smart Eyes	Stefano Sacco	University of Alberta	Similarity Analysis of Temperature and Fluid Flow in the GTAW Arc
10:20-10:50	Jim Galloway	Conestoga College	Wire Arc Additive Manufacturing – Structural Steel Alloys	Vicente Sánchez	University of Alberta	Energy Balance in Gas Metal Arc Welding
11:00-12:00	Fabtech Keynote: Doug Gilmore (Theater located at the end of the 14000 aisle on show floor)					
12:00-12:50	Lunch Room: Sutherland 3-5					
	Room: Sutherland 1			Room: Sutherland 2		
12:50-1:20	LeRoy Douglas	Xiris	Weld Cameras as an Enabling Technology in Welding Automation	Abdelbaset Midawi	University of Waterloo	Evaluation of AHSS Thin Sheet Gas Metal Arc Welds Utilizing DIC Technique
1:30-2:00	Rick Krecmer	RoboVent	When to Use a Fume Gun (And When Not To)	Jihui Yan	University of Waterloo	Efficient buildup of Inconel 718 on additive components with thin-wall geometries using electrospark deposition
2:00-3:00	Fabtech Keynote: Cyber Security (Theater located at the end of the 14000 aisle on show floor)					
	Room: Sutherland 1			Room: Sutherland 2		
3:10-3:40	Eduardo Rocha	University of Alberta	Determining Systematic Error in Voltage Predictions vs. Voltage Settings for GMAW Welding Procedures in the Lincoln Procedure Handbook	Shiyuan Song	University of Waterloo	Influence of Electrode Force on Liquid Metal Embrittlement Cracking During Resistance Spot Welding of Third Generation Advanced High Strength Steels

DAY 2: Thursday, June 16, 2022

8:00-9:00	Breakfast Room: Sutherland 3-5					
	Room: Sutherland 1			Room: Sutherland 2		
	Presenter	Affiliation	Presentation Title	Presenter	Affiliation	Presentation Title
9:00-9:30	Alysha Yinger	RoboVent	Resistance Welding Safety: Fume Collection Best Practices	Patricio F. Mendez	CCWJ University of Alberta	Recent Developments in Welding Research at the CCWJ
9:40-10:10	Chris Pilcher	IPG Photonics	Fiber Laser Welding Advancements in the Automotive Industry	Goetz Dapp	University of Alberta	High Speed Videography of Welding: Fundamentals and Techniques
10:20-10:50	Mohsen Mohammadijoo	Nova Chemicals	Weld Integrity of High Strength Steel Pipelines: Challenges and Design Opportunities	Carter Trautmann	University of Alberta	Use of Low Transition Temperature Steel Alloys In Welded Overlays for High Wear Applications
11:00-12:00	CWB Keynote: Sam Barrett, Vice President- Preconstruction | Walters Group: Building Exceptional Project Experiences. (Theater located at the end of the 14000 aisle on show floor)					
12:00-12:50	Lunch Room: Sutherland 3-5					
	Room: Sutherland 1			Room: Sutherland 2		
12:50-1:20	Taylor Dittrich	Lincoln Electric Company	Advancements in GMAW Technology for Zinc-Coated Steels	Adrian Gerlich	University of Waterloo	Wire Arc Additive Manufacturing using Advanced Pulsed Waveform Gas Metal Arc Welding
1:30-2:00	Daniel Ramirez	University of Alberta	Zero Programming Repair with Laser Cladding	Nazmul Huda	University of Waterloo	Friction welding of 304-stainless steel and zirconium alloy tubes
2:00-3:00	Automotive Panel- Changing the Gear Ratio: Women in the Automotive Industry					
	Nikki Noble- Lambton College | Taylor Dittrich- Lincoln Electric | Stephanie Hoffman- Underground Metalworks | Leanne Jeffries - Assured Performance (Theater located at the end of the 14000 aisle on show floor)					
3:10-3:40	Jim Galloway	Conestoga College	The AC Component of Direct Current Arc Welding Machines			
3:40-4:00	Max Ceron : Closing Remarks | Room: Sutherland 3-5					

AUTOMOTIVE WELDING

CANWELD PROGRAM - DAY 1

June 15th, 8:15-8:50 | Room: Sutherland 3-5
Emmanuel Santos | University of Waterloo
The Mechanics of GMAW Arc

EMMANUEL SANTOS

University of Waterloo

BIO: Emanuel Santos is currently a research associate at the Centre for Advances Materials Joining (CAMJ) at the Department of Mechanical and Mechatronic Engineering of the University of Waterloo. Previously, Emanuel was a member of the Welding Engineering team at Liburdi Automation Inc, a division of The Liburdi Group of Companies, for 4 years, where he worked on the development of welding procedures for various industries, including nuclear and oil and gas, as well as the development of proprietary welding processes. He holds a Master's of Applied Science degree from the University of Waterloo, and received his Bachelors in Mechanical Engineering from the Federal University of Pará, Belém, Brazil. During his bachelors he was an undergraduate research scholar from CNPq (National Council for Scientific and Technological Development) developing his activities at the facilities of the Laboratory of Characterization of Metallic Materials (LCAM) at Federal University of Pará.

Abstract: In many high-productivity joining applications such as thick-section welding, the overall deposition rate is a critical economic factor. The deposition and wire feed rate during arc welding is mainly coupled to the arc current. However, the metal transfer mode, and ultimately the maximum arc current that can be applied is limited by issues with arc dynamics. This presentation will explore a number of solutions that have been explored recently to develop more consistent high deposition rates, by modifying the electrode design, metal feed method, and control of the current. The prospects for emerging applications such as additive manufacturing will also be discussed.

UNIVERSITY OF WATERLOO

AUTOMOTIVE WELDING

CANWELD PROGRAM - DAY 1

KEN MUI

Lincoln Electric Company

June 15th, 9:00-9:30 | Room: Sutherland 1
Ken Mui | Lincoln Electric Company
Filler Metal Certification Testing Compared to Production Welds

BIO: Ken Mui is the Application Engineer for the Lincoln Electric Company. He has been with Lincoln for over 28 years and has a broad range of experience in all arc welding processes and welding metallurgy.

In his current role he provides technical support for a wide array of welding processes across all industry segments. Ken has presented at various Welding association events on topics such as SAW, Waveform controlled SAW, Modes of GMAW Transfer, One Sided Panel Welding, Optimizing CVN properties in welds.

He is the current Chair of the B.C. chapter of the Canadian Welding Association. Mr. Mui attended Michigan State University where he obtained his B.Sc in Mechanical Engineering and is a P.Eng registered in BC

Abstract: Welding electrode manufacturers are required to maintain conformance certification for various agency such as CSA W48, AWS A5.X, ABS, LR, DNV etc.

These documents are useful for relative comparison of expected weld metal mechanical properties and chemistries.

These documents and results should not always be relied upon to predict real world production welding results.

The significant factors that can cause production mechanical results to diverge from conformance certificate results will be discussed in detail.

LINCOLN ELECTRIC

MITCHELL GRAMS

Apollo-Clad
Laser Cladding

June 15th, 9:00-9:30 | Room: Sutherland 2
Mitchell Grams | Apollo-Clad Laser Cladding

Effect of Relative Dimensions for Weld Pool and Powder Cloud on Laser Cladding Catchment Efficiency

BIO: Mitchell holds a BSc in Mechanical Engineering (2015) and a PhD in Materials Engineering (2021) from the University of Alberta. His thesis research was conducted on the topic of Predictive Expressions for Welding Residual Stress and Distortion. Mitchell is currently a post doctoral researcher at the Canadian Centre for Welding at Joining (CCWJ), in partnership with the industrial welding and manufacturing company, Apollo-Clad Laser Cladding. His current work is focused on applying analytical modelling to optimize catchment efficiency in powder-fed coaxial laser cladding. Mitchell has been a member of the CWB Association since 2013 and is presently serving as administrator for the CWBA Edmonton chapter.

Abstract: Laser clad overlays provide enhanced corrosion and/or wear performance for new production and repair of components across a wide range of Canadian industries, including automotive, oil & gas, agriculture, aerospace, and mining. Compared with other welding processes, lasers offer improved control over deposition and heat input, low thermal distortion, minimal dilution, and avoidance of undesirable metallurgical changes in the materials. The use of powder feed enables deposition with complex multi-component systems; however, the superior cost and performance enabled with custom powder alloy blends often comes at the expense of a reduced material usage efficiency compared to wire fed processes. In the current work, a general model was developed to predict the powder catchment efficiency based on the relative dimensions of the molten weld pool and the distribution of powder incident on the workpiece. A novel experimental apparatus was used to obtain direct in-situ measurements of the process powder distribution. Comparison between the measured distribution and the known weld pool geometry was used to identify the most significant sources of catchment inefficiency. Based on this new understanding, a custom laser module was designed to permit a relative shift between the origin of the powder distribution and the laser beam. The effect of this relative shift was evaluated in an industrial cladding trial, where a measurable improvement in the powder catchment efficiency was observed.

MAHYAR ASADI

Novarc Technologies

June 15th, 9:40-10:10 | Room: Sutherland 1
Mahyar Asadi | Novarc Technologies
An Industrial Journey from Welding Vision to Smart Eyes

BIO: Mahyar Asadi PhD, PEng, PMP, IWE is the Vice President of Innovation at Novarc Technologies, directing smart welding technologies using industry 4.0 platforms, machine learning, intelligent vision systems, digital twins, IIoT, and simulation tools for welding automation and autonomy. His industry-leading work has resulted in more than 110 published papers and significant awards from the International Institute of Welding, the CWB Association, The American Society of Mechanical Engineers, and Canada's Natural Sciences and Engineering Research Council. Mahyar has a Ph.D. in Computational Weld Mechanics and high-profile experience applying his knowledge to the automotive, aircraft, marine, medical devices, energy, oil & gas, and heavy machinery industries. He holds a Professional Engineering License, PMP certificate, IWE designation, ASME FFS, Digital Twins, and Machine Learning Certificates. He is also an adjunct professor in the Materials Department at the University of British Columbia, teaching a signature course on "Welding and Joining of Materials."

Abstract: Automation and smarting are now pervasive and the welding industry is embracing solutions to empower welders with these advanced tools. The journey of smarting can take many forms. The authors share their experiences when they started this journey with solving some basic needs for weld automation and how the path evolved toward smarting a welding system for a spool-welding robot (SWR). The first step was a monitoring system including a camera that enables welders with a live stream of the arc, puddle, and weldment without protective equipment and safety concerns. In general, welders are well receptive to this tool, so telewelding and telemonitoring are growing in various welding applications. Seam tracking becomes the next typical automation need. Many technologies are available to address the market, including arc sensors, laser, vision, ultrasound, electromagnet, infrared, and tactile. We talk about our experience in integrating these tools with SWR, including the advantages and disadvantages from our client's point of view. We continue talking about our journey to add advanced features to go beyond the expectation of welders and deliver an extraordinary performance by adaptive control and automation algorithms in the tool. Finally, the journey expands toward developing smarting capabilities to train the machine over time for continuous improvement using an extensive data set of SWR machines' performance around the globe.

NOVARC TECHNOLOGIES

STEFANO SACCO

University of Alberta

June 15th, 9:40-10:10 | Room: Sutherland 2
Stefano Sacco | University of Alberta
Similarity Analysis of Temperature and Fluid Flow in the GTAW Arc

BIO: Stefano Sacco is from Chile, studied Mechanical civil engineering at the Universidad de Chile. Nowadays, Stefano is an M.Sc. student in Materials Engineering at the University of Alberta, working at the Canadian Centre for Welding and Joining and developing a hydrogen concentration model for steelmaking and welding procedures. His topics of interest are renewable energies, nuclear power, additive manufacturing, artificial intelligence, and its different applications. It has developed simple equations that allow calculating the width of the plasma arc in the GTAW process, setting the minimum size of the piece that we can weld with a fixed current and for a specific type of gas.

Abstract: This study developed a new mathematical model to quantify the width and length of the plasma arc in GTAW. This novel estimation process allows to obtain immediate results and without convergence problems.

The methodology is based on similarity analysis of the non-isothermal Landau-Squire solution, which is an exact solution of the Navier Stokes and energy equations for a round laminar jet. While the Landau-Squire solution had been used before to approximate velocities in the arc, its application to the prediction of temperature had not been successful. The challenge overcame in this work, is to make a better systematic assessment of the power that must be assigned to the point heat source. The ultimate goal of this project is to obtain general expressions to predict the shape and temperature of the GTAW arc.

The plasma behavior is modeled parametrically, with a critical temperature dividing the conducting and non-conducting behavior. For argon, this temperature is 7,200 K.

Numerical simulations that account for temperature-dependent plasma properties were run to compare with the analytical treatment for the case of argon. The maximum error observed was 33 % for a current of 300 A.

UNIVERSITY OF ALBERTA

AUTOMOTIVE **WELDING**

CANWELD PROGRAM - DAY 1

June 15th, 10:20-10:50 | Room: Sutherland 1
Jim Galloway | Conestoga College
Wire Arc Additive Manufacturing – Structural Steel Alloys

JIM GALLOWAY
Conestoga College

BIO: Jim Galloway is a Professor and the Coordinator of Welding Programs at Conestoga College in Cambridge, Ontario. He holds a B.A.Sc. in Industrial Engineering Technology, is a Certified Engineering Technologist, and is a graduate of Conestoga's weld tech programs. He is also a Journeyman Welder (Red Seal) and an International Welding Technologist (IWT). Over his 40-year career he has worked as a welding inspector and R&D technologist in the power generation industry, a technical manager in the rail-car manufacturing industry, and the manufacturing manager for an automated production machinery manufacturer. Jim also volunteers with several CSA Technical committees including CSAW117.2 (welding safety), CSC26 (arc welding equipment), and CSAW48 (electrodes & filler metals).

Abstract: Wire arc additive manufacturing (WAAM) using the gas metal arc welding (GMAW) process (or GMAAM) to produce large-format components from structural steel alloys is an emerging technology. Much work needs to be done to develop a better understanding of the process variables, shape control, structural integrity, productivity rates, the requirements for quality assurance, and secondary processing requirements.

To help address some of these concerns Conestoga College in Cambridge, ON, has recently completed a project to produce a series of thin-walled plates (where the thickness is less than 10% of the height) with the WAAM process using three different alloy feedstock electrode wires. The pieces were destructively tested using standard methods. Results from tensile, hardness, impact toughness, guided bend tests, and other analysis will be reported.

Before the structural steel engineering and design community will seriously consider the use of these components in their structures it will also be necessary to prove the structural integrity of large-format prototypes, determine essential variables and acceptance criteria, and establish a practical qualification framework.

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VICENTE NÚÑEZ SÁNCHEZ

University of Alberta

June 15th, 10:20-10:50 | Room: Sutherland 2
Vicente Núñez Sánchez | University of Alberta
Energy Balance in Gas Metal Arc Welding

BIO: Vicente holds a Mechanical Engineer degree from his home country at the University of Chile and is currently starting a MSc. In Materials Engineering at the University of Alberta, working at the Canadian Centre for Welding and Joining (CCWJ). Vicente started his research in 2021 when he received the Emerging Leaders of Americas Program (ELAP) scholarship, reason why he could travel to Canada and develop his thesis at the CCWJ. He is currently a graduate student at the laboratory and his research is focused on the understanding of the droplet temperature at the GMAW process. For the near future he is looking to build some strategies to help engineering students to different projects.

Abstract: This work allows to comprehend a part of the theory behind the droplet temperature at the Gas Metal Arc Welding (GMAW) process. The development of an energy balance on the electrode is made to understand the power at the anode and by it the droplet temperature. To obtain the value and understand its behavior, it is necessary to understand the mass that evaporates from the droplet. The models that were generated allows to understand the behavior of the droplet, its evaporation, temperature, and deposition rate. The composition of the mass evaporated from the droplet is obtained, and the amount of energy lost in the process. The composition of the mass evaporated varies from one electrode to other, and so the amount of mass that evaporates or stays as a droplet. A relation between the current and the Wire Feed Speed (WFS), evaporation rates and anode fall voltages is generated for different wire compositions. These relationships can be used to reduce evaporation and increase deposition rates, as also to study the behavior on new alloys and different conditions of voltage and WFS.

UNIVERSITY OF ALBERTA

LEROY DOUGLAS

Xiris

June 15th, 12:50-1:20 | Room: Sutherland 1
LeRoy Douglas | Xiris
Weld Cameras as an Enabling Technology in Welding Automation

BIO: After receiving his Master of Business Administration from the University of Calgary, LeRoy went on to work in business development, HR consulting in the manufacturing sector and corporate strategy before joining the Xiris team. LeRoy Douglas has been directly involved with numerous educational and training facilities across the US and Canada, helping them achieve goals in revolutionizing welding education by providing the ability to visualize and record weld demonstrations. With over 10 years of experience in the manufacturing and education sector, LeRoy's focus is on growing Xiris' presence in the education market.

Abstract: Xiris weld cameras are an enabling technology that are used across a wide variety of welding automation applications. As we know, critical welding applications need to be continuously monitored to verify that input parameters are being optimized and the best quality welds are being achieved. Often, this means a qualified welding personnel needs to be placed near the weld source to visualize what is going on. A better and more innovative solution is to introduce a weld camera into automated welding processes.

Xiris Automation weld monitoring cameras have been implemented on numerous hard automation applications such as a longitudinal seam welder joining together two plates of a large pipe, as well as flexible automation applications such as a 3D printing project for metal structures in construction. When placed near the process, the weld cameras can capture the details of the weld, as well as its immediate environment, allowing the operator to completely

XIRIS

ABDELBASET MIDAWI

University of Waterloo

UNIVERSITY OF WATERLOO

June 15th, 12:50-1:20 | Room: Sutherland 2
Abdelbaset Midawi | University of Waterloo
Evaluation of AHSS Thin Sheet Gas Metal Arc Welds Utilizing DIC Technique

BIO: Abdelbaset Midawi is a Research Associate at the University of Waterloo. He joined the Centre of Advanced Materials Joining (CAMJ) at the University of Waterloo in 2013. Dr. Midawi's area of expertise is characterizing the post-welded properties of weldments. During his Ph.D., he developed a technique to measure the local strength of weld zones of GMAW/GTAW welds in welded structures using instrumented indentation technique. Currently, Dr. Midawi is working to optimize the strength of spot weld and GMA welds state-of-the-art third generation advanced high strength automotive steels by understanding the link between welding parameters, local microstructure, and mechanical properties; in addition, developing novel experimental techniques to characterize the AHSS spot weld mechanical properties. This research aimed to improve industrial competitiveness and reduce the environmental footprint of new vehicles.

Abstract: Automotive producers are trying to increase the use of advanced high strength steel (AHSS) in frame applications, allowing thinner gauges of steel and reducing the vehicle weight. Gas metal arc welding (GMAW) is one of the joining techniques used to join thin sheets of AHSS for automotive applications. However, the gas metal arc welding (GMAW) process will produce heterogeneous mechanical properties throughout the joint due to the thermal weld cycle. In addition, the joint current standard testing procedure, such as the lap joint test, will impact the mechanical performance of the joint due to promoting bending stress, which will lead to sample rotation during testing. In this work, the digital image correlation (DIC) technique and hardness mapping were used to characterize the local mechanical properties of the butt and lap joint configurations for three different AHSS alloys. The microstructure and hardness were correlated to understand the effect of welding consumables and zinc coating on the local properties on the joint performance. Finally, a novel and easy testing procedure were suggested to reduce the rotation of the specimen during the lap shear test, which could be adopted to avoid the unaccounted bending effect and improve the simulation predictions.

AUTOMOTIVE WELDING

CANWELD PROGRAM - DAY 1

June 15th, 1:30-2:00 | Room: Sutherland 1
Rick Krecmer | RoboVent
When to Use a Fume Gun (And When Not To)

RICK KRECMER
RoboVent

BIO: Rick Kreczmer is an industrial air filtration industry veteran with more than 24 years of experience in sales and executive management. As President of RoboVent, he has led the company through new product innovation for an evolving manufacturing environment. Rick joined RoboVent as the Executive Vice President of Sales and Marketing in January 2019 and was named President in August 2019. Prior to joining RoboVent, he spent 20+ years working in a variety of roles in the industrial air filtration, liquid filtration and dust collector industries. He brings a wealth of experience and an excellent understanding of air filtration, industrial ventilation and safety for the metalworking industry.

Abstract: Used correctly, a high-quality fume extraction gun (or torch) can remove 90-95% of weld fumes right at the source, before they enter the welder's breathing zone. But is it always the best choice? We take a closer look at considerations when choosing between a fume gun and other fume extraction options. (This presentation is non-promotional and applies to any brand/model of fume gun.) We'll cover:

- Pros and cons of fume guns and alternatives for weld fume collection, including fume arms and backdraft tables
- Proper use of a fume gun: applications, technique and selection
- Expected fume capture efficiency for different scenarios
- How to determine whether you need a secondary backup air filtration or ventilation solution
- What type of dust collector is needed when using a fume gun

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JIHUI YAN

University of Waterloo

June 15th, 1:30-2:00 | Room: Sutherland 2
Jihui Yan | University of Waterloo
Efficient buildup of Inconel 718 on additive components with thin-wall geometries using electrospark deposition

BIO: Jihui Yan received HBSc degree in Materials Science from the University of Toronto in 2021. He is currently first-year master student in the Department of Mechanical and Mechatronics, Centre for Advanced Materials Joining at the University of Waterloo, supervised by Prof. Norman Zhou and co-supervised by Prof. Peng Peng. Jihui Yan's research activities and interests are in the general area of materials science and processing technologies for aerospace applications, specialized in micro joining, and high entropy alloy.

Abstract: Repair of out of tolerance or damaged metals during use is mostly achieved through welding techniques. However, parts with special geometries are repaired with special welding techniques. Most common welding techniques have a power input that is so high that it changes the properties of the more fragile parts, which in turn leads to erosion and secondary damage to the part. In this study, the electrospark deposition (ESD) technique was used to repair damaged parts with thin-walled properties, and to simplify the process, the thin metal walls were made by metal 3D printing. The effects of key parameters on deposition rates and defect rates were studied during the manual deposition process, and the properties of samples with parameters of practical application, such as cross-sectional hardness and heat-affected zone (HAZ), were investigated. At the same time, automated ESD has been studied in a cursory manner and the results are quite different from those of manual ESD, which means that a completely new research program on automated ESD can be established.

UNIVERSITY OF WATERLOO

June 15th, 3:10-3:40 | Room: Sutherland 1

J. Eduardo Alvarez Rocha | University of Alberta

Determining Systematic Error in Voltage Predictions vs. Voltage Settings for GMAW Welding Procedures in the Lincoln Procedure Handbook

J. EDUARDO ALVAREZ ROCHA

University of Alberta

BIO: J. Eduardo Alvarez Rocha is a MSc Student in Welding Engineering at the University of Alberta. His research focus is on validating models to create design tools for welding procedure development by understanding and predicting fall voltages across the arc. Prior to his MSc studies at the University of Alberta, Eduardo worked as a Mechanical Engineer, Welding Inspector, In-Service pressure equipment inspector, and B-pressure welder over his 15-year career in the Alberta energy sector.

Abstract: The heat input is a key component of a welding procedure, which is dependent on the several fall voltages that compose the total voltage fall. As current practice is primarily reliant on trial and error to determine voltage settings for a desired heat input, having a means to predict the voltage fall is of interest to welding engineers. To predict heat input, the fall voltages (along with their respective systematic error) that make up the total voltage fall in arc welding must be understood.

To gain an understanding of systematic error in voltage predictions, welding voltages were calculated in this study by considering fall voltage contributions in the arc and compared to over 150 welding procedures with different parameters, transfer modes and base metals (carbon steel, stainless steel, aluminum, and copper). The concept of self-regulating arc in GMAW was used to define arc length in relation to wire diameter. An equation was derived for GMAW-Sp and a definition of half the wire diameter was considered for GMAW-S. Cathode and anode fall voltages proved to contribute to ~80% of the total voltage with noticeably less for aluminum (~65%). Arc column fall voltages were verified to increase with current. Error in predictions were highest with GMAW-S with ~7.2% and ~30% error for carbon and stainless steel, respectively. Predictions for GMAW-Sp had smaller errors using the calculated arc length with ~1, 3, and 2% for carbon steel, aluminum, and copper, respectively.

UNIVERSITY OF ALBERTA

SHIYUAN SONG

University of Waterloo

June 15th, 3:10-3:40 | Room: Sutherland 2
Shiyuan Song | University of Waterloo
Influence of Electrode Force on Liquid Metal Embrittlement Cracking During Resistance Spot Welding of Third Generation Advanced High Strength Steels

BIO: Shiyuan Song is a graduate student at the Center of Advanced Materials Joining at University of Waterloo. After receiving her diploma with honors in Chemical Engineering at the Northern Alberta Institute of Technology and bachelor's degree with honors in Energy Engineering at the University of Calgary, Alberta, she investigates Liquid Metal Embrittlement in third generation advanced high strength steels.

Abstract: The third generation of advanced high strength steels (3G-AHSS) with high strength and ductility has been developed to address the demands of the automotive industry to produce safer, lighter, and more environmentally friendly vehicles. When joined with resistance spot welding (RSW), zinc coating on these steels, used for corrosion protection, melts and can penetrate grain boundaries (GB) under thermal tensile stress. The resulting loss of strength at the GBs may lead to liquid metal embrittlement (LME) cracking. The industrial implementation of 3G-AHSS has been limited by concerns with their susceptibility to LME, thus its mitigation has become a priority for automotive manufacturers. The variation of electrode force during RSW is known to influence LME, however, the mechanism of this influence is not fully understood.

This work studied the influence of electrode force variation on LME cracking during RSW of 3G AHSS. The electrode force was variated between 3.5 and 5.5. kN. The resulting location of cracks in welds and crack severity were measured. Additionally, numerical process simulation was used to study effects of electrode force on stress and temperature changes during welding and to correlate these changes with the LME occurrence.

UNIVERSITY OF WATERLOO

AUTOMOTIVE WELDING

CANWELD PROGRAM - DAY 2

June 16th, 9:00-9:30 | Room: Sutherland 1
Alysha Yinger | RoboVent
Resistance Welding Safety: Fume Collection Best Practices

ALYSHA YINGER
RoboVent

BIO: Alysha is an experienced Manufacturing and Design Engineer with a passion for making manufacturing environments safer and healthier. She has a proven track record of creating effective, safe and efficient industrial air filtration and ventilation solutions to help clients meet or exceed OSHA standards for indoor air quality. As the Director of Engineering for RoboVent, she oversees a team of engineers and system designers and guides the company in development of new, innovative air quality solutions. Alysha holds a Bachelor of Engineering in Mechanical Engineering from the University of Colorado – Denver and is currently seeking a Master's in Materials Science and Engineering from Wayne State University.

Abstract: Resistance welding is widely used in the auto industry. Is fume collection needed? Many welders assume the answer is no since it does not produce the volume of visible fumes common to stick welding methods. But resistance welding can still produce dangerous fumes—especially when welding galvanized steel or coated metals commonly used in automotive. In this presentation, we will discuss:

- Volume and composition of resistance welding fumes compared to stick welding, with special emphasis on galvanized steel, coatings and lubricants
- Permissible exposure limits (PELs) and dangers of exposure to resistance welding fumes, especially with galvanized metals
- Considerations in design of a weld fume collection system for manual or robotic resistance welding for automotive suppliers, including discussion of source capture and ambient options
- How to handle fumes that include gaseous emissions such as zinc oxide from galvanized metals or gas phase emissions from coatings and lubricants
- Standards and regulations for air filtration system design

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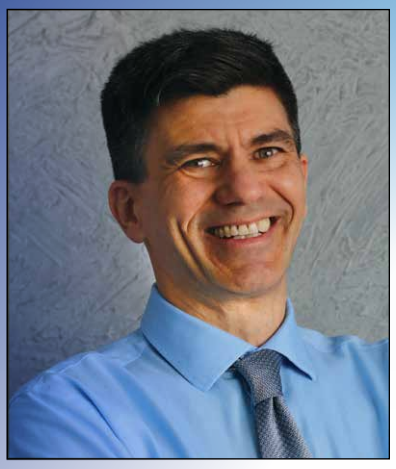
AUTOMOTIVE WELDING

CANWELD PROGRAM - DAY 2



PATRICIO F. MENDEZ

CCWJ University of Alberta

June 16th, 9:00-9:30 | Room: Sutherland 2
Patricio F. Mendez | CCWJ University of Alberta
Recent Developments in Welding Research at the CCWJ

BIO: Prof Mendez is the Weldco/Industry Chair in Welding and Joining and Director of Canadian Centre for Welding and Joining at University of Alberta. His teaching and research focus on physics and mathematics of welding and materials processing, including heat transfer, magnetohydrodynamics, arc plasma, thermodynamics, and kinetics. Applications include wear protection for mining, and oil extraction, alloy development, procedure development, new welding processes such as laser cladding, casting, solidification, and direct metal additive manufacturing using semi-solid processing. Before joining the University of Alberta in January 2009, he taught and researched at the Colorado School of Mines. Before that, he was a consulting engineer at Exponent Inc. In 1995 Dr. Mendez co-founded Semi-Solid Technologies Inc. in Cambridge, MA. Prof. Mendez holds a Ph.D. and a M.S. degree in Materials Engineering MIT, and a Mechanical Engineer degree from the University of Buenos Aires. He is a Fellow of the AWS and the CWBA. Awards include, UofA Outstanding Mentorship in Undergraduate Research, AWS William Irrgang Award, IIW Kenneth Easterling Award, the ASM Brian Ives Award, the NSF CAREER Award, the MIT Rocca Fellowship, and UBA Research Fellowship. He has 79 indexed publications and 9 patents.

Abstract: On the Process area, the CCWJ has developed a methodology to predict welding features for carbon steels, stainless steels, aluminum, superalloys, magnesium alloys, and others. The welding features predicted include cooling rate, HAZ width, melting efficiency, solidification time, residual stresses, distortion, voltage, and deposition rate. On the Materials development area, we have developed an understanding of austenization temperature in microalloyed steels. This is relevant because modern welding processed can have a fast-heating rate that raises the austenization temperature, resulting in smaller HAZ than expected. Smaller HAZ is desirable, but not knowing the reason means we can lose the advantage without control over it. Another project aims at developing alloys to surface railroad wheels.On the Automation area, we have demonstrated a system for robotic laser repairs of worn equipment without programming. In this system, the robot determines a path of action based on a 3D scan of the part that needs to be rebuilt. Artificial intelligence has also been applied to quantify metal transfer from high-speed videos. The CCWJ is also leading an initiative consolidating Canadian laser cladding operators and their supply chain (upstream and downstream) into a consortium.

UNIVERSITY OF ALBERTA

AUTOMOTIVE WELDING

CANWELD PROGRAM - DAY 2

June 16th, 9:40-10:10 | Room: Sutherland 1
Chris Pilcher | IPG Photonics
Fiber Laser Welding Advancements in the Automotive Industry

CHRIS PILCHER
IPG Photonics

BIO: Chris Pilcher is the Regional Sales Manager for IPG Photonics in Canada, the largest supplier of Fiber lasers worldwide. He has held similar positions at Trumpf Canada and Rofin-Sinar. In addition, Chris was President and CEO of Welding and Cutting Solutions who were responsible for integration and installation of specialized systems.

Mr. Pilcher served as the Director of Automation and Engineering Manager at Liburdi Automation Incorporated. He has over 30 years of experience in the welding and systems integration field and holds a degree in Mechanical Engineering from the University of Waterloo, as well as, a degree in Computer Science. His experience has spanned many industries including Nuclear, Aerospace, Automotive, Mining and Medical.

Abstract: This presentation focuses on the laser welding process in an automotive environment and its benefits to future welding techniques and current implementations.

With more attention being focused on fuel economy, light weight vehicles, lower emissions, and electric vehicles, manufacturing has come under increasing pressure to offer faster and more cost competitive solutions. Globalization and the rising cost of labour have placed increasing pressure on companies to automate and offer faster yet more accurate manufacturing. With the inception of fiber laser technology, the price of the one-micron wavelength has reduced to approximately one tenth of the price since 2006. This reduction is also complimented by higher laser reliability. Laser welding is now at the forefront of many industries including communication, mining, automotive, medical and nuclear. Laser processing includes cladding, welding, cutting, cleaning, and heat-treating.

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AUTOMOTIVE WELDING

CANWELD PROGRAM - DAY 2

June 16th, 9:40-10:10 | Room: Sutherland 2
Goetz Dapp | University of Alberta
High Speed Videography of Welding: Fundamentals and Techniques

GOETZ DAPP

University of Alberta

BIO: Goetz Dapp is the Associate Director of the Canadian Centre for Welding and Joining (CCWJ). He has an eclectic interdisciplinary background and a great interest in welding. Goetz holds a welding certificate from the German Welding Society (DVS), a PhD in Theatre Studies from the University of Amsterdam, degrees from the University of Toronto and the Johannes Gutenberg-University in Mainz, Germany, and a Professional Acting Diploma from Sheridan College, Oakville, Ontario.

Prior to becoming Associate Director, Goetz was Postdoctoral Fellow at the CCWJ, and a Sessional Instructor at the Department of Drama at the University of Alberta. Goetz has a lot of experience in weld vision, multimedia applications and technology; his interest in pursuing interdisciplinary research has seen him work as a consultant on several multimedia projects; direct, create, and work on numerous theatre performances and concerts; work in film and television; and pursue a research project that brings together Welding and Theatre.

Abstract: This presentation introduces modern methods, challenges, and practical implementations of high-speed imaging of metal transfer in welding. Challenges to high-speed imaging of metal transfer in welding are the fast time constant of phenomena observed, and the intense light emissions that result in very high contrasts. With high-speed cameras becoming more affordable and dedicated commercial weld vision systems being available, the presentation will provide a comprehensive overview of core elements contributing to successful high speed weld vision. Topics include light emissions from the arc and molten metal, considerations for camera types and sensors, filter, and video digital files, and the three main lighting techniques used: backlighting, front lighting, and natural radiation. The presentation will also discuss examples of the current implementation at the Canadian Center for Welding and Joining.

UNIVERSITY OF ALBERTA

June 16th, 10:20-10:50 | Room: Sutherland 1
Mohsen Mohammadijoo | Nova Chemicals
Weld Integrity of High Strength Steel Pipelines: Challenges and Design Opportunities

MOHSEN MOHAMMADIJOO
Nova Chemicals

BIO: Mohsen is a Materials and Metallurgy Research Engineer with NOVA Chemicals. He has been working on several major pipeline projects aimed to address evolving and high demanding industry challenges, such as mill and field girth welds integrity and fracture mechanics. Among his responsibilities is assessment of materials integrity and reliability for a diverse range of applications in energy industry. He enjoys playing soccer and tennis, and spending time with his little son.

Abstract: Increased use of higher grade of steels, i.e., X70 and X80, with higher yield and tensile strength for pipelines has induced an unintended weld strength under-matching as a likely possibility, thereby compromising the integrity of pipeline welds, especially those with crack-type flaws. It is well understood that pipelines weld integrity is primarily influenced by three parameters, namely: (i) steel metallurgy, i.e., alloy design and TMCP processing, (ii) welding procedure specification, and (iii) loading conditions during pipeline construction and operation. This situation is of greater convolution when conducting integrity assessment for pipelines with heavier gauges (≥ ~15 mm) for strain-based design applications where a complex condition of steel's centerline and non-uniform microstructure, increased number of weld passes, and loading/crack conditions can coexist as compared to the lighter gauge pipelines. Accordingly, this study is aimed to elucidate the challenges associated with designing strain-based pipelines and define potential opportunities for a greater weld integrity through evaluation of a series of different grade pipelines subjected to different welding scenarios. Fabricated welds were analyzed in terms of tensile strain capacity, hardness mapping and local brittle microstructure across the weld joints. Steel composition and welding heat input impacted the strain capacity of the weld joints; however, selection of an appropriately designed welding consumable revealed to be of greater importance to ensure pipeline weld integrity.

AUTOMOTIVE WELDING

CANWELD PROGRAM - DAY 2

June 16th, 10:20-10:50 | Room: Sutherland 2
Carter Trautmann | University of Alberta
Use of Low Transition Temperature Steel Alloys In Welded Overlays for High Wear Applications

CARTER TRAUTMANN
University of Alberta

BIO: Carter Trautmann holds a BSc in Engineering Physics and Is currently completing a Master's Degree in Materials Engineering with the Canadian Center for Welding and Joining (CCWJ) at the University of Alberta. His research focuses on plasma transferred arc welding applications and overlay metallurgy, with additional Interest in high-speed video capture and plasma physics. Involved with the CCWJ since 2020. Carter also works and volunteers with different makerspace initiatives, directed a team designing and racing fuel cell electric vehicles during his bachelor's degree and is currently acting as chair of the University of Alberta CWB Association student chapter.

Abstract: This presentation provides a summary of the mechanism and applications of Low Transition Temperature (LTT) stainless steel alloys in high-wear applications. Surface cladding continues to be a popular method of repair and fabrication of components in high-wear environments. One of the greater challenges is how the differential heating and cooling of the overlay and base metal during application can result in significant residual stresses. These stresses can significantly reduce the strength and lifetime of overlays by causing crack initiation and propagation through the overlay. To combat this, work is being done on LTT alloys that experience the martensite transition later in cooling. This transition helps reduce the residual tension introduced by differential cooling by causing a volume expansion of the weld metal late into solidification. If sufficient expansion is introduced, compressive stresses can result in the deposited material, significantly altering the performance characteristics of the overlay. With discussion on the mechanism, design, and application of these materials, we hope to present opportunities for designers and manufacturers to significantly increase the lifetime of parts experiencing exceptional wear conditions. In particular, the application of these alloys through plasma transferred arc welding as a manufacturing step for railway wheels.

UNIVERSITY OF ALBERTA

AUTOMOTIVE WELDING

CANWELD PROGRAM - DAY 2

June 16th, 11:00-12:00 | Theater located at the end of the 14000 aisle on FABTECH show floor
KEYNOTE Sam Barrett, Vice President- Preconstruction | Walters Group Inc.
Walters Group: Building Exceptional Project Experiences

SAM BARRETT
Walters Group Inc.

BIO: Sam is a decisive, dynamic, and highly motivated construction & management professional with a 'get it done' attitude. He began his career as an undergraduate structural design engineer, serving the UK and Irish structural steel market with Severfield NI Ltd.

He later joined Walters Inc. as a Project Coordinator and very quickly moved into a Project Manager position. Having led teams on numerous complex projects across a wide variety of sectors, Sam is proven to excel in high pressure environments and actively seeks new and creative ways to overcome obstacles.

In his current role, Sam leads group pursuits on projects across North America, big and small. He is an excellent collaborator and communicator who is focused on building long standing relationships with team members, customers, and suppliers.

Abstract: Founded in 1956, Walters Group is a family-owned steel construction company that designs, fabricates, and constructs commercial and industrial projects throughout North America. From industry leading Architecturally Exposed Structural Steel (AESS) and high-end architecturally fabricated structures, to the latest in lightweight flooring technology, we're able to bring innovative ideas and solutions to our clients.

Having navigated a global pandemic our commitment to acting as a true partner and delivering an exceptional experience has never been more critical, so please join us as we demonstrate how combining people, planning & performance has helped our clients realize their vision.

We will provide a profile of the company as it grew from its roots to its current integrated network of companies. Showcasing some of the projects that we have completed, with a focus on those that provided some interesting challenges.

WALTERS INC.

AUTOMOTIVE **WELDING**

CANWELD PROGRAM - DAY 2

TAYLOR DITTRICH

Lincoln Electric Company

June 16th, 12:50-1:20 | Room: Sutherland 1
Taylor Dittrich | Lincoln Electric Company
Advancements in GMAW Technology for Zinc-Coated Steels

BIO: Taylor Dittrich is a wire products engineer in the Consumable Research and Development department at Lincoln Electric. Her primary focus has been the development of innovative wire welding products, the sustainment and improvement of legacy products, and manufacturing process development. Before joining Lincoln Electric, Taylor graduated from The Ohio State University with a Bachelor of Materials Science and Engineering with Honors Research Distinction. While at Ohio State, Taylor conducted research at the Impulse Manufacturing Laboratory under Professor Glenn Daehn, focusing on microstructural analysis along impact weld interfaces of Vaporizing Foil Actuator Welds (VFAW).

Abstract: Automotive requirements for improved corrosion resistance on frame/chassis components have created a challenge for OEMs/suppliers to increase corrosion life of painted welds, particularly on zinc-coated components. Corrosion life is linked to surface silicates, which are multi-component oxides formed on the weld surface via chemical reactions between the shielding gas and deoxidizing elements in the base metal/consumable. Zinc-coating also increases welding difficulty as zinc vapor can be trapped in the weld metal as porosity. Lincoln Electric has developed a low silicon GMAW wire, SuperArc® XLS, to lower surface silicate formation for improved paint adhesion while improving porosity performance on zinc-coated steels. SuperArc® XLS accomplishes these improvements through a mixture of deoxidizing and surface tension modifying elements with minimal silicon. When combined with an appropriate waveform, this process solution provides low spatter, high speed welds while maintaining a low level of porosity. This study compares welds made on automotive grade, zinc-coated steels with SuperArc® XLS versus an industry standard GMAW wire. The results from porosity analysis of those welds showcases clear improvement by the low silicon wire. A secondary study compares corrosion resistance of welds made with SuperArc® XLS versus an industry standard GMAW wire. The welds were subjected to 120 cycles of a cyclical corrosion testing, and testing results showcase the improvement in corrosion resistance of the low silicon wire.

ADRIAN GERLICH

University of Waterloo

June 16th, 12:50-1:20 | Room: Sutherland 2
Adrian Gerlich | University of Waterloo
Wire Arc Additive Manufacturing using Advanced Pulsed Waveform Gas Metal Arc Welding

BIO: Prof. Gerlich is Associate Professor in the Department of Mechanical and Mechatronics Engineering, University of Waterloo, and Director of the Centre for Advanced Materials Joining. Gerlich is an expert in materials science, microscopy, welding and material characterization. His most significant recent contributions are in the area of the joining of dissimilar materials and friction-stir welding. Gerlich has led a research team of an average of 10 research associates and graduate students; he has secured more than $2.9M in operational funding and $5M in infrastructure for welding and materials processing. He has over 170 publications in peer-reviewed journals, and been recognized by the American Welding Society on multiple instances, including the Professor Koichi Masubuchi Award and Adams Memorial Membership Award.

Abstract: The use of advanced pulsed waveform control during gas metal arc welding is evaluated for the application of additive manufacturing, often rereferred to as 3D printing. Producing metal components with this technique is commonly done with powders, however this is slow and costly, and so the use of arc welding for deposition of material is an alternative, known as wire arc additive manufacturing (WAAM). Although there are systems available for performing WAAM using gas metal arc welding, the output that can be achieved using the latest advanced waveforms are seldom discussed. This investigation will use a water-cooled base, and two modified wave shapes, operating in the short circuit transfer mode. The walls were build using carbon steel (ER70-S electrode wire, 0.035" diameter), with a length of 12 in, and 5in tall, and with thickness ranging from 4 to 5 mm. The produced walls are compared in terms of bead geometry, surface roughness, microstructure and hardness.corrosion resistance of the low silicon wire.

UNIVERSITY OF WATERLOO

June 16th, 1:30-2:00 | Room: Sutherland 1
Daniel Ramirez | University of Alberta
Zero Programming Repair with Laser Cladding

DANIEL RAMIREZ

University of Alberta

BIO: Originally from Mexico City, Daniel Rodrigo Ramirez Rebollo has a degree in Mechatronics engineering as the foundation of his formal education during these years his experience include the areas of aeronautics, advanced manufacturing and automation. He obtained a PhD in engineering sciences that expanded his research areas to advance robotic systems, machine learning and advance control theory. During this stage of his studies he was able to spend time working at Cambridge University in the UK and Karlstad University in Sweden. His areas of interest are advanced robotics, advanced control theory, advanced manufacturing and automation. He built a solid theoretical career with a great hands-on component by designing, building and implementing mechatronics systems.

Abstract: Laser cladding has found intense use in the manufacturing industry, thanks to its capabilities of rebuilding pieces with tailored and enhanced properties. This has led to an increased necessity of correctly controlling one or multiple of the involved parameters in this process such as dimension of the pool, layer height, dilution, laser power, powder flow, gas flow, etc.

The main objective for this work is to automate the use of the machinery involved in the process reducing the input from the on-site engineers for manually tuning design parameters during dry run and the actual process execution and increases engineering efficiency and practicality. Obtaining a system capable of manufacturing or repairing low volume high value parts with the aid of 3D scanning techniques and parametric programming of a Kuka manipulator. We have successfully put together all the systems with a complex but functional integration of the robotic manipulator, 9Kw laser, coaxial and optics zoom, powder feeder; all controlled by our system PLC. This setup is unique in the sense that no programming of the robot is intended, and the system should reconfigure itself according to the operator inputs by using the embedded models and empirical verification to automatically set the correct parameters to achieve the desired results.

Test results have shown the successful repair of complex geometries in worn out parts directly from our partner industries that have led to open new doors in optimizing this new technology not only for research purposes but with aims of technology transfer to industries for their benefit and efficiency gain.

UNIVERSITY OF ALBERTA

AUTOMOTIVE **WELDING**

CANWELD PROGRAM - DAY 2

June 16th, 1:30-2:00 | Room: Sutherland 2
Nazmul Huda | University of Waterloo
Friction welding of 304-stainless steel and zirconium alloy tubes

NAZMUL HUDA

University of Waterloo

BIO: Nazmul Huda is a professional with high profile education and work experience in power generation, welding process, material and metallurgy, and weld failure analysis. His education consists of B.Sc in Mechanical Engineering, M.Sc in Welding /Joining Engineering and Ph.D in Material Engineering. Nazmul has experience in working various multi-national power generation companies, and was also lecturer at BGMEA University, Bangladesh. Nazmul is currently working as post doctoral fellow at the University of Waterloo, focusing on different welding processes (Gas Metal Arc Welding, Linear Friction welding process, Rotary Friction welding process etc.), material characterization, mechanical properties evaluation and failure analysis.

Abstract: Many nuclear applications rely on zirconium (Zr) alloys and stainless steels (SS) for key cooling system components including future designs such as a supercritical water cooled reactor (SCWR). In the present work, tubular sections of Zr and SS with a 55 mm nominal diameter were rotary friction welded at 1000 RPM and 1200 RPM with a 20% variation in burn-off pressure. The developed joints contained a micron-thick interface reaction layer, with specimens extracted by electrical discharge machining in order to perform tensile testing. Joint strengths ranged from 300 to 414 MPa, however ductility was limited to <3%, due to a difference between the material properties of the two metals causing increased deformation being focused in the Zr side. Analysis by transmission electron microscopy reveals that a sub-micron scale reaction layer contains several sub-layers with different phases combining zirconium, iron and nickel while evidence of minimal diffusion limited to this reaction layer.

UNIVERSITY OF WATERLOO

AUTOMOTIVE WELDING

CANWELD PROGRAM - DAY 2

NIKKI NOBLE

TAYLOR DITTRICH

STEPHANIE HOFFMAN

June 16th, 2:00-3:00 | Theater located at the end of the 14000 aisle on FABTECH show floor PANEL, Changing the Gear Ratio – Women in the Automotive Industry

Nikki Noble - Coordinator and Professor of Welding: Lambton College

BIO: Starting her passion in 2001, it was love at first spark. Nikki is a Journeyperson Welder with over 30+ welding certifications. She has dedicated her career in helping others achieve their goals. Her automotive journey follows with a 68' Beaumont, trailer repairs and new builds, and working for General Dynamics Land Systems in the Military Vehicle Repair program. Representing numerous events in support of young workers in welding, females in the trades, social media industry and more: Nikki has a fuel of enthusiasm that illuminates her passion in education and the trades.

Taylor Dittrich – Wire Products Research Engineer: Lincoln Electric Company

BIO: Taylor Dittrich is a wire products engineer in the Consumable Research and Development department at Lincoln Electric. Her primary focus has been the development of innovative wire welding products, the sustainment and improvement of legacy products, and manufacturing process development. Before joining Lincoln Electric, Taylor graduated from The Ohio State University with a Bachelor of Materials Science and Engineering with Honors Research Distinction. While at Ohio State, Taylor conducted research at the Impulse Manufacturing Laboratory under Professor Glenn Daehn, focusing on microstructural analysis along impact weld interfaces of Vaporizing Foil Actuator Welds (VFAW).

Owner-Underground Metal Works Workforce Development Specialist - American Welding Society

BIO: Stephanie Hoffman is an accomplished welder, educator, and trades advocate. With over 20 years of industry experience, starting from the bottom and working her way to the top becoming the face of the American Welding Society, creating industry content, and touring the country promoting careers in welding. When not on the road Stephanie has built a well-respected name for herself owning and operating Underground Metal Works, a custom fabrication company and welding school located in Forked River NJ. You can also find Stephanie on the all-new original series Metal Shop Masters on Netflix.

AUTOMOTIVE **WELDING**

CANWELD PROGRAM - DAY 2

June 16th, 2:00-3:00 | Theater located at the end of the 14000 aisle on FABTECH show floor PANEL, Changing the Gear Ratio – Women in the Automotive Industry

LEANNE JEFFERIES

Leanne Jefferies - Vice President, Assured Performance Network/Certified Collision Care

BIO: Leanne Jefferies is Vice President, Assured Performance Network/ Certified Collision Care, overseeing business operations and OEM relationships in Canada and the US. Assured Performance Network/ Certified Collision Care manages and administers OEM Certification programs for 12 OEMs in Canada, and 4 OEMs in the US. The Assured Performance certified network includes approximately 3500

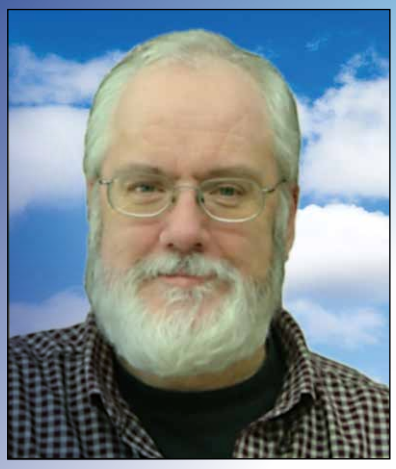
dealer and independently owned collision businesses. The Assured Performance program recognizes and promotes shops that have what it takes to properly repair today's automobiles back to manufacturer's specifications to ensure the fit, finish, durability, safety and value of the vehicle. Certified shops are audited to ensure they have the tools, equipment, and technicians with training and welding certifications, to safely and properly repair vehicles after a collision.Leanne's has invested 25 years in the collision repair industry working with stakeholders to collaborate and develop solutions to create a better, more sustainable future. She also supports Skills Canada, helping to promote careers in the industry to youth for the past 14 years. She was honored in 2014 as a Most Influential Women in Collision Repair (MIW). Leanne's experience includes 12 years ownership of a collision repair facility, 5 years in collision industry publishing, and from 2014 -2016 was Director of Collision Programs for AIA, where she successfully restructured and expanded the scope and scale of the Canadian Collision Industry Association (CCIF).

Abstract: We will discuss the importance of engaging women into the trades to support the transforming dynamics of the developing automotive and manufacturing markets in North America. By looking at educators, entrepreneurs, welders, fabricators and mentors from all sectors we will assess how we can increase the ratio of women to men in the workplace, some of the supports needed, and how to change the image of the trades as a "men only" forum.

AUTOMOTIVE WELDING

CANWELD PROGRAM - DAY 2

June 16th, 3:10-3:40 | Room: Sutherland 1
Jim Galloway | Conestoga College
The AC Component of Direct Current Arc Welding Machines



JIM GALLOWAY
Conestoga College

BIO: Jim Galloway is a Professor and the Coordinator of Welding Programs at Conestoga College in Cambridge, Ontario. He holds a B.A.Sc. in Industrial Engineering Technology, is a Certified Engineering Technologist, and is a graduate of Conestoga's weld tech programs. He is also a Journeyman Welder (Red Seal) and an International Welding Technologist (IWT). Over his 40-year career he has worked as a welding inspector and R&D technologist in the power generation industry, a technical manager in the rail-car manufacturing industry, and the manufacturing manager for an automated production machinery manufacturer. Jim also volunteers with several CSA Technical committees including CSAW117.2 (welding safety), CSA C232(CSC26) (electric welding equipment), and CSAW48 (electrodes & filler metals).

Abstract: It is widely believed internationally that at the same no-load voltage (or OCV) alternating current (AC) arc welders are more electrically hazardous than direct current (DC) machines. In some standards AC welding machines are limited to less than 25V (rms) for wet location welding whereas for the same work, DC machines of up to 70V (plus 10% ripple) are allowed. Other standards allow the use of up to 113V peak when using a DC welder in an environment with an increased risk of electrical shock.

To better understand the actual waveform, peak voltage, and ripple factors produced by typical DC welding machines, Conestoga College in Cambridge, ON, sampled 40 separate models capable of DC-SMAW. The study sampled traditional transformer rectifiers, modern inverters, 3-phase and 1-phase machines, and engine drive machines, typical of the Canadian machine inventory. (The machine model names will not be publicized.)

The current edition of the Canadian standard CSAW117.2-19 (Safety in welding, cutting, and allied processes) does not differentiate between machines with AC or DC output in assessing the secondary electrical shock hazard to welding personnel. The primary purpose of this study is to raise awarness in the international community of the potential hazards from the AC waveform component of typical DC output welding machines.

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The CWB Welding Foundation is a national registered charity that supports the Canadian welding industry by raising awareness and delivering programs to address the welding skilled trade shortage and mismatch in Canada. We do this by encouraging Canadians to explore careers that require welding skills, technology and engineering; enabling education-based programs to attract young people to the skilled trades and welding; supporting pathways to employment; and reducing barriers that affect key groups such as women, Indigenous students and others. Our efforts also help companies access and develop the skilled welding workforce they need to stay competitive.

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LINCOLN ELECTRIC

MICHAEL N. VUCHNICH AWARD

Presented by LINCOLN ELECTRIC

VIWEK VAIDYA

Awards 2022

Award Recipient: Viwek Vaidya

Nominated by: Dan Tadic

Award Description: In 1986, the Lincoln Electric Company of Canada Limited established a trust fund for the purpose of funding the Michael N. Vuchnich Award, ($2,500 and a plaque) to be administered by a committee appointed by the Board of Directors of the Welding Institute of Canada and now its successor organization, the CWB Association.

This award is presented annually to an individual who, in the opinion of the CWBA Awards Committee, has "done the most to advance the science, technology and application of arc welding in Canada in their Career."

Nominee Viwek Vaidya graduated from the prestigious Indian Institute of Technology, Kharagpur India in metallurgy and then completed his Master's from McMaster University in 1971 in ceramics. Brian Graville and Dave Reynolds hired Viwek to work with them at the Dominion Bridge company. Initially working on developing the electroslag welding process at the laboratory, Viwek later worked at the Industrial Products division making welding procedures for multitude of pressure vessels and components for Candu reactors for Quebec and New Brunswick.

In 1975, wanting to learn French, Viwek joined Canron Mechanical Division at Three Rivers as Chief Welding engineer making Titanium and Stainless steel washer drums and equipment for pulp and paper industry. At Canron as the Fabrication Manager, Viwek and his team built the spillway gates for the 10,000 MW LG-2 project, while working with legendary people like Wayne Baigent.

In 1979 Viwek returned to the pressure vessel industry working for Combustion Engineering at Sherbrooke, Quebec making utility and recovery boilers for the Canadian and International markets in Thailand, New Zealand, Mexico and China. Viwek and his team built the ABI aluminium smelter, with its 484 pot shells, superstructures, and the anode bars. Welding procedures developed for building the Pechiney pot shells were later used for making other pot shells in other countries.

Viwek has several patents to his name in various fields like flame cutting tips, ice rink insulation, welding productivity monitoring and more recently Gold mining for wireless wear monitoring of SAG mill lifters in the mining sector using EMAT and friction welding technologies.

LINCOLN ELECTRIC

ROBERT J. JACOBSON MEMORIAL AWARD

Presented by CWB ASSOCIATION

JIM REID

Awards 2022

Award Recipient: Jim Reid

Nominated by: Halifax Chapter Executive Committee

Award Description: The Robert J. Jacobson Memorial Award was established in 1986 to honour an individual "who has made an outstanding contribution to the CWBA Chapter operations." This annual award consists of a cheque for $1,000 and a plaque which are presented at the CWB Association's Annual Awards dinner.

Nominee Jim Reid is a retired Canadian Welding Bureau (CWB) employee. Jim started with the CWB as a certification services representative and was the Atlantic Regional Manager when he retired.

Jim, along with T. Earl Forgeron and several other individuals, were instrumental in starting the Halifax Chapter of the Canadian Welding Association. The National Board agreed to allow a Halifax Chapter to be formed during the National Meeting held in Halifax in May of 2002. This newly minted Chapter would have approximately 20 members.

Initially, Jim and T. Earl Forgeron were co-chairs of this new found Chapter. After approximately two years, Jim agreed to take on the role of Chair and Earl carried on as Financial Secretary for the Chapter. During these early years, Jim was very active in holding monthly meetings, plant tours, various social events, Christmas events, and the Annual Joint Chapter Golf Tournaments together with the Nova Scotia Chapter.

Annual fund raising was primarily through the joint Chapter yearly desk calendar sales. The proceeds from these fundraising efforts typically were provided to sponsor scholarships for welding students at the Community Colleges. Jim was a strong advocate for student assistance and participation in the Chapter's activities. He was also a supporter and judge/adjudicator at the Skills Canada competition for many years.

In late 2013, Jim started to plan for a new Halifax Chapter Executive. In June of 2014 Jim was successful in recruiting a few "younger" enthusiastic members to be elected as the new Executive. Under Jim's guidance, a successful delivery of the Chapter occurred, and the new Executive was committed to keep the Halifax Chapter active.

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THE CWB ASSOCIATION PRODUCTIVITY AWARD

Presented by LINDE CANADA INC.

SIS GROUP

Awards 2022

Award Recipient: SIS Group

Nominated by: Glen D Kelsh

Award Description: The 2022 Productivity Award sponsored by Linde Canada Inc. will be presented to a company that has made an investment and a conscious effort to increase efficiencies and productivity of its operations. The investment maybe in automation, process or procedure improvement. The nominations must be supported by documentation. The selection will be made by the awards committee and the winner will be notified by the middle of July. The award consists of a CWBA plaque and a $5,000 cash prize.Nominee SIS Group SIS Manufacturing was founded in 2008 and is now an international supplier of industrial and construction-related steel products and services. Using innovative state-of- the-art equipment and technology. The SIS Group began as a field service Team with modest weld / machine equipment and real estate. The company began aggressively pursuing the " Locomotive Frame Assembly " business, shared locally with a couple met/fab shops, including Algoma Steel. SIS made an investment and acquired an Ogden Dual Head SAW automated gantry system. Once commissioning was completed, the gantry went on to weld thousands of locomotive frame assemblies. SIS continued to Gain additional locomotive components having won their customers confidence. Locomotive " Jacking Pads " were one component that robotic automation potential. With a tilt / turn positioner to accommodate the " Jacking Pads" size and weight with ease providing perfect welds every time. Next, as Algoma Steel decommissioned their existing " Beam Welding Line ", the SIS Team picked up the slack with a Dual, Panasonic Robotic Gantry, 90ft in length assembled by an integrator and commissioned by Panasonic. This unit has been very successful welding not only beams but additional locomotive frames not requiring SAW process. Again, the SIS Team was awarded further locomotive components including the " Front End ". After some review / assistance from Linde and again, embracing automation, the team decided on a 40-ton positioner, parked at the " Home " position of the dual robotic gantry, allowing for Locomotive " Front End " welding when not welding frames or beams. Many additional pieces of automation have been added over the years bringing me to the latest project.Tony Porco and the SIS Group have always embraced automation realizing it's the only way for continued success in this industry. He is a pillar in our community converting our abandoned paper mill into a wonderful green space with multiple restaurants, brew pubs, a Train Station and a regulation outdoor rink. He sees value in everything and discards nothing … always thinking out of the box to increase productivity and re purpose the obsolete.

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THE CWB ASSOCIATION FELLOW AWARD

Presented by CWB ASSOCIATION

GENTRY WOOD

Awards 2022

Award Recipient: Dr. Gentry Wood

Nominated by: Dr. Priti Wanjara, Dr. Thomas J Lienert and Professor/Dr. Patricio Mendez

Award Description: In 2013 the CWB Association has established an annual Fellow Award that honours one individual with an exemplary reputation and service to advancement of welding sciences, technology application, research, education, publication of papers, books, Journal articles and peer recognition. The award consists of a CWBA plaque and a $1,000 cash prize. Nominee Dr.Gentry Wood is a world leader in the field of laser cladding, and his contributions have put Canada at the forefront in this novel manufacturing technology. His scientific approach to the field has revolutionized laser cladding, reaching capabilities considered impossible just a few years ago.

People at the laser operations of the Fraunhofer Institute, also in Germany, interact with Gentry with enormous respect for his knowledge of the process. This is especially noteworthy, because they seldom like to recognize anybody might know more than them in the Laser welding area! When Dr. Priti Wanjara was putting together an ambitious international project involving laser cladding and partners at McGill and Germany, Gentry and Apollo were the go-to references as industrial partners from Canada. Gentry's meteoric career is a fantastic story of the great things that are possible in our world of welding. Soon after finishing his PhD studies he joined Apollo Clad, a small branch of a larger machining company in Edmonton. Within months in his first year in the job, he had saved the company more money than his whole salary by applying his knowledge to save cladding powder that was being applied inefficiently and by writing proposals for industrial research at Apollo that were funded by the government. On his second year in the job, his reputation for laser manufacturing attracted the attention of Tesla in California, who made an attempt to poach him away from Canada. Gentry's decided to stay, despite the large financial incentive. It is a decision for which we are forever grateful! Gentry has presented his research frequently for many years at CanWeld, Fabtech, IIW and other venues. He has published in peer-reviewed papers, obtained a Canadian patent, filed for a US patent, and has more in process. One of his articles was the cover of the AWS Welding Journal in Sept. 2018. He has generated more than $2M in research awards. He has taught in the Fundamentals of Welding class at UofA and in the Introduction to Materials Science class and mentored a large number of undergraduate and early stage graduate students.

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WILFRED I. VELLA MEMORIAL AWARD

Presented by CWB ASSOCIATION

WILL MORLIDGE

Awards 2022

Award Recipient: Will Morlidge

Nominated by: Josh Brewster

Award Description: The Wilfred I. Vella Memorial Award has been established to recognize an individual CWBA member who has both supported the work of the CWBA as a member and has made a significant contribution to our society through humanitarian and/or volunteer efforts and is seen as a leader in their community. The award consists of a CWBA plaque and a $2,500 cash prize

Nominee Will Morlidge has been a key contributor to the CWBA Calgary chapter for over a decade. In this time, he has held almost all of in 2017. In 2017, Will's wife passed away from cancer. This was surely a very hard time for Will, but his support for the local welding community never changed.

Will and his wife endeavored to volunteer their time to support the Calgary's new cancer care center. After the passing of Will's wife, he has decided to continue to support cancer care in Alberta by volunteering his time. Will provides guidance and perspective from a patient's point of view. Will attends Patient and Family Advisory Committee (PFAC) monthly meetings to discuss all aspects of care and interaction with patients. The entire focus has been on the patient centered model, where the cancer patient is in the middle and is surrounded by family, cancer physicians, technicians, and nurses, and support staff. The concept is that everyone involved is working for the benefit of the patient in the cancer centre.

The Alberta Health Services (AHS) asked PFAC to provide feedback and guidance from the patient and family perspective on the development of the new $1.4 billion Calgary Cancer Care Centre. The new Calgary Cancer Centre will open in 2023 and is projected to staff 300 research cancer doctors in 1.3-million square feet of hospital space. Treatments for patients will be individualized to the genetics of each patient, making this leading edge cancer treatment for Western Canada.

Will is tough, fair, committed, and always friendly. Will represents the best of the CWB Association volunteers and is a force for good in Calgary.

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GOLD AWARD

Presented by CWB ASSOCIATION

DAVID MILLAR

Awards 2022

Award Recipient: David Millar

Nominated by: 2021 CanWeld Conference Audience

Award Description: This award recognizes the best paper submission by a single or lead author at the Annual CanWeld Conference and as selected by our conference attendees. The Conference Gold Medal Award consists of a plaque and a $1,000 cash prize.

Nominee David Millar began his career as a Welder at the Govan Shipyard Glasgow in 1975, and after his training in 1979 he joined the company NDE dept. In 1990 he was appointed Quality Control Manager of the Kvaerner Govan Shipyard in Glasgow and in 1995 he took up the post as yard Welding Engineering Mgr. After 21 years' Service with the yard David left to start up a new company NST Welding (UK) Ltd (a subsidiary of Norsk Sveiseteknikk AS of Norway) And from 1996 to 2020 David was providing technical support to companies in over 26 countries, specialising in the use of flux & metal cored wires with ceramic backing tiles for single sided welding. In May 2020 David was approached by Gullco International to take up the role as Worldwide Business Development Manager, a position that would involve him providing technical support for Gullco's staff based in Canada, USA, UK, Brazil, India and South East Asia.

Euro Ing David Millar CEng was awarded the Diploma in Welding Engineering from TWI/ Cranfield in 1985, and the Diploma in Management Studies from Caledonian University in 1989. In 1991 he received his Master of Philosophy Degree in Welding from Strathclyde University in Glasgow. He is a Certified European Welding Engineer, International Welding Engineer, European Engineer (FEANI) Chartered Engineer and Fellow of the Welding Institute, Cambridge. He received the Distinguished Service Award from The Welding Institute in Cambridge in 2013.

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CWB GROUP IS CELEBRATING ITS 75TH ANNIVERSARY

Celebrating 75 years. A milestone we are so excited to celebrate and proud to have achieved. Our journey began in 1947 with a mission to serve the Canadian public and welding sector by providing innovative and globally relevant certification, knowledge, and technical expertise. Today, we continue with that same mission and are proud to be a trusted global leader in welding education, the primary provider of several certifications and qualifications for welding professionals and companies. We also serve as a knowledge base for welding and welding-related content for over 75000 welding professionals and welding organizations and employ technical experts for all your welding needs.

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We invite you to join us in our 75th anniversary celebration by following and engaging with our social media pages. Let us take you down memory lane as we explore our history and reflect upon our future.

Thank you for supporting us for the past 75 years,
and we look forward to 75 more!

CWB 75TH ANNIVERSARY

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