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FRANK CHENG

PROFESSOR,
CANADA RESEARCH CHAIR,
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SUITABILITY OF EXISTING NATURAL GAS PIPELINES FOR HYDROGEN TRANSPORT - RISK OF STEEL PIPES TO HYDROGEN EMBRITTLEMENT

Development of new energy technology at full scale is critical to achieving the 2050 net-zero target. With the lack of a wide range of infrastructure to keep the new energy economy on a rapid-development trajectory, existing pipelines provide a promising alternative for effective and economic transport of new energies (fuels) such as hydrogen.

Safety is paramount for hydrogen transport by pipelines. Hydrogen embrittlement (HE) potentially occurs to compromise the structural integrity of steel pipes. This talk starts with an introduction of the benefits that pipelines provide for development of a full-scale hydrogen economy. The technical background of the HE phenomenon will be imparted, detailing unique features of the problem occurring in high-pressure gaseous environments, along with the effects of pipe steel metallurgy and stressing conditions. Technical gaps in repurposing existing pipelines for hydrogen service will be identified, and further actions are proposed to mitigate and control the HE occurrence.

about

DR. FRANK CHENG is a Professor and Canada Research Chair in Pipeline Engineering at the University of Calgary. Frank is an internationally recognized researcher in Energy Pipeline Technology, specializing in pipeline corrosion and cracking, steel metallurgy, defect assessment, and hydrogen pipelines. He is the author of 4 books (Pipeline Coatings, Stress Corrosion Cracking of Pipelines, and AC Corrosion of Pipelines) and 275 journal papers. The total citations of his publications exceed 13,700, with a H-index of 71.

Frank is the recipient of numerous prestigious awards from professional associations such as CIM, MetSoc, NACE, ASM, IOM3 and IAAM. Frank was named the Canadian Distinguished Materials Scientist in 2019. He is elected Fellows of NACE, IOM3, ICorr, IAAM and CSCP (Chinese Society for Corrosion Protection). He is serving as the Editor-in-Chief of Journal of Pipeline Science and Engineering. Frank obtained his Ph.D. in Materials Engineering at the University of Alberta in 2000.



**MAUREEN
JENSEN**
DIRECTOR AND ADVISOR



MINERS EMBRACING CHANGE IN THE INDUSTRIAL REVOLUTION 4.0

We are all living in a time of massive change which is forcing all industries to respond. Not only has the world gone digital but the established global order is changing, causing pressure on the ability to establish secure supply chains, the access to affordable capital, and the attraction of experienced human talent. These pressures have impacted all businesses and it is no different for mining. While in the past miners have been innovative when they have had to be, today there is no option. This speech will outline the global trends impacting all businesses and the changes that miners are undertaking to address these stresses. These include operational changes such as electrification, robotics, product traceability, water conservation and talent management, regulatory changes such as ESG reporting, climate reporting and community engagement and financing changes such as sustainable financing.

about

MAUREEN JENSEN was the Chair and CEO of the Ontario Securities Commission (OSC) from 2016-2020 and prior to this was the Executive Director and Chief Administrative Officer from 2011 – 2016.

Before joining the OSC, Ms. Jensen was SVP, Surveillance and Compliance at the Investment Industry Regulatory Organization of Canada (IIROC 2008-2011) and President and CEO and VP regulation Eastern Region (2002-2007) for Market Regulation Services Inc., the independent market regulator for all Canadian equity markets.

Prior to her work as a regulator, Ms. Jensen held several senior positions at the Toronto Stock Exchange and had an earlier 20-year career in the mining exploration industry. She currently serves as Vice Chair of the Board of the Toronto Centre, a Director of Franco Nevada Corporation, Chair of OBSI (Ombudsman for the Banking and Securities Industry), a public governor of FINRA and is Chair of The Prosperity Project.

Ms. Jensen has a BSc. in Geology, is a Registered Professional Geoscientist (P.Geo), has a Doctor of Laws (Honoris Causa) and holds both the ICD.D and the GCB.D designations.



PHILLIP JOHN MACKEY

PRESIDENT, P.J. MACKEY TECHNOLOGY INC.

THE GLOBAL ENERGY TRANSITION AND METALS FROM THE PRESENT WORLD TO A LOW-CARBON ONE. THE IMPORTANCE OF METALS AND CANADA'S ROLE

Metals are central to the global energy transition towards a low-carbon world. For example, copper's unrivalled electrical properties mean it is essential for all types of renewable energy, while nickel, cobalt and lithium are important battery metals; steel is essential for infrastructure projects. This presentation puts into perspective the importance of these critical metals in the global energy transition and discusses new mining-metallurgical technologies now under early development to meet the needs of a low-carbon world. This includes new technologies based on green hydrogen as a reductant and high-temperature electrolytic techniques for metal production. Given the challenges faced by the industry in meeting "Net Zero" and the technical and engineering work required means the timelines to reach this goal will be quite lengthy. Canada can play an important role in helping to diversify the global supply of critical metals and these aspects are also discussed.

about

PHILLIP MACKEY is a well-known metallurgist in the field of non-ferrous extractive metallurgy and a member of the Canadian Mining Hall of Fame. He advanced the development of not one but two significant copper smelting technologies. Mackey obtained the BSc (Hons.) and PhD degrees from the School of Metallurgy at the University of NSW, Australia. He then moved to Montreal to join Noranda, where with others, helped develop the Noranda Process in the 1970s, the world's first continuous copper smelting process, and later co-invented the Noranda Converting Process in the 1980s. These processes remain in operation at the only remaining copper smelter in Canada.

He has also worked extensively on the processing of lateritic nickel ores. One of Dr. Mackey's interests since the early 70s is the energy consumption in metals production. Drawing on considerable experience, he has recently focussed on new technology for metal production in a low-carbon world.

The Phillip Mackey Symposium was held in his honour at the 2019 Copper Conference in Vancouver. He is a Past President of the Metallurgical Society, and a Fellow of CIM and TMS. His CIM and METSOC Awards include the Silver Medal; a Special Medal of Honour, the Selwyn G. Blaylock Medal and the Airey Award for "outstanding contributions" to the field of extractive metallurgy.



STEVEN J. THORPE

PROFESSOR,
DEPARTMENT OF MATERIALS SCIENCE AND ENGINEERING,
UNIVERSITY OF TORONTO

DECARBONIZATION THROUGH HYDROGEN PRODUCTION VIA ELECTROLYSIS

Hydrogen is increasingly emerging as a clean energy carrier when produced using water electrolysis linked to a renewable energy source (hydro, solar, wind). The hydrogen economy is an energy generation, delivery, and utilization system in which hydrogen gas ($H_2(g)$) is the energy carrier. If realized, the hydrogen economy would supplement and/or replace the hydrocarbon economy, which relies on petroleum, natural gas, and coal. Any new energy currency must be able to compete in a variety of important sectors, transportation, power, and materials processing through the adaptation and innovation of new technologies in areas such as steelmaking, and Cu and Ni processing. The transition to the hydrogen economy would diminish the global societal dependence on non-renewable energy sources and dramatically reduce the production of green-house gases. Three recent reports by the Hydrogen Industry Council predict a strong increased global demand for hydrogen and decreased costs for "green" hydrogen.

Canada has a tradition as a major international player in the fields of electrolysis and fuel cell research and has much to gain from advancing the boundaries of this technology. This talk will focus on recent advances in water splitting technologies, cell and systems design, and material advances that will permit large scale, economical, production of green hydrogen to benefit the Canadian electrochemical industry and the globe.

about

STEVEN J. THORPE obtained his PhD degree from the Faculty of Applied Science, University of Toronto, in 1985 and was a NATO Science Fellow at MIT from 1985 to 1987. He returned to the University of Toronto as a NSERC University Research Fellow and was promoted to Professor in 1998. Professor S.J. Thorpe spent a two-year leave of absence at Stuart Energy Systems where he served as Vice President, Technology.

Professor Thorpe has also served as Secretary, Education Chairman, and Vice Chair of the Ontario Chapter of ASM, Executive and Director of the Basic Sciences Division of CIM and the Corrosion Section of the Metallurgical Society of CIM, and Academic Leader of the Metals and Ceramics Program of the Ontario Center for Materials Research (OCMR).

Professor Thorpe has won numerous awards including the Impact Student Choice Award, Sustained Excellence in Teaching Award, Faculty Teaching Award, Academics in Industry Award from OCMR, the Outstanding Young Members Award from the Ontario Chapter of ASM, and the W.S. Wilson Metal and Centennial Thesis Award.

Dr. Thorpe's current research is focused on the electrochemical behaviour of new amorphous and nanocrystalline materials in the fields of electrolysis and fuel cells and has co-authored more than 70 refereed publications. He has served as supervisor or co-supervisor for > 80 graduate and undergraduate student theses.