CANADIAN INSTITUTE OF MARINE ENGINEERING
MARINE ENGINEERING DIGEST

The *Marine Engineering Digest* has a new, simpler format. It's shorter and will be published more frequently. We welcome any comments!

Medal of Excellence 2018 Awarded to Bill Jamer

Bill Jamer is the first Medal of Excellence nominee to receive two independent nominations, and they came from two different corners of the country, which is a clear indication of the Canada-wide effect he's had on the marine engineering community.

Bill started his career in the Canadian Coast Guard (CCG) before moving to Public Works (now PWPSC), where he served as Senior Director for Marine Procurement. He then returned to the CCG as Director General of Integrated Technical Services. Since his retirement, he has worked as a consultant to public and private sector marine clients.

Of particular note: Bill received a government citation for organizing the evacuation of some 15,000 Canadian citizens during the 2006 war in Lebanon. His nominator writes: "It was because of his impressive global network and connections that he was able to accomplish that monumental task."

The other nominator says "He is known to get things done in the most expedient fashion and with the highest quality. For this, I am proud to say, he is known and well respected from coast to coast."

National Chair Bert Blattmann (left) making the presentation.

Mari-Tech 2018 A Resounding Success!

It is with great pride that we extend a great big thank you to all our participants for a very successful Mari-Tech 2018 this past April in Victoria. By all metrics, the conference was a great success, and we thank all of our sponsors for their generous support.

The organizing committee is very pleased to announce there were almost 500 attendees. The exhibition hall was filled to capacity. Attendees were treated to a depth of information and presentations that made it a win, win, and win scenario for all.

We are grateful to our Technical Presenters, offering leading edge presentations on numerous topics from renewable resources, LNG use and adaptation, emissions rules, "the internet of things", circuit breakers, and many more. We are especially grateful to our Keynote speakers, Mark Collins and Robb Wight, who gave insightful and informative presentations.

Our Master of Ceremonies, RAdm Richard Greenwood kept us all in line, with expediency and military precision, keeping the conference focused and running well.

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Photos and text courtesy Martin Leduc, taken from www.mt18.ca

Mari-Tech 2018 continued:

The organizing committee: see wwww.mt18.ca for details.

The volunteer organizing committee started planning this conference back in October 2016, meeting regularly at least once a month for one to three hours each time, and exchanged over 1900 emails. We were abundantly grateful for the professional services of Pam Prewett and her team at Podium Conference, and the staff of the Victoria Conference Center.

Mari-Tech 2019 *Full Speed Ahead: Firing on all Cylinders* will be held in Ottawa, April 23rd to the 25th, 2019. It is presented as a joint collaboration between our Ottawa Branch and the Society of Naval Architects and Marine Engineers Eastern Canada.

Wireless Inductive Energy Transfer from Shore to Vessel Storage System

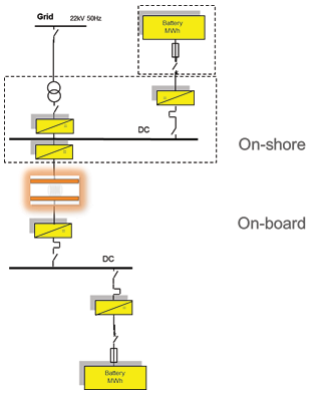
by Mark Keneford, General Manager Marine Solutions, Wärtsilä Canada

With the marine industry's increasing acceptance of hybrid propulsion systems, charging the ship's batteries is a necessary procedure when the vessel is in port. However, with quick turn-arounds increasingly the aim of owners and operators, the time allowed for charging can be rather short. This challenge can be addressed by enabling charging to be activated at an early stage in the docking of the ship. The Wireless Charging System is connected to the DC-bus on-board the ship, enabling more than 2 MW of power to be transferred between the onboard and onshore coils over a distance of between 400 and 500 mm.

The system delivers considerable benefits, especially to hybrid ferry operators needing to adhere to tight schedules. Firstly, the available battery charging time is increased since power can begin transfering during the mooring process. This can even be integrated with an automatic mooring system such as from Cavotec, an engineering and automation company with whom Wärtsilä has worked closely to develop a combined mooring and induction charging solution. The inductive charger has automatic galvanic insulation, and there is no risk of damage being caused because manual connecting and disconnecting is eliminated.

The process and discussions are:

- DC Power is converted to high frequency current flowing in the inductive sending coil.
- Resonance capacitors compensate voltage drop.
- Current in inductive sending coil creates a controlled magnetic field.
- Magnetic field from sending side creates a current in the inductive pick-up coil.
- High frequency current flowing in the inductive pick-up coil is rectified to DC Power.
- Power is stored in the ship batteries.



Harmonic voltage distortion will be improved by using inverter harmonic injection control. Voltage drop in the grid will be compensated by using inverter reactive power compensation con trol. Lack of power from the grid during maintenance or special conditions can be compensated for with energy storage. Transient faults in the grid will be handled by ride through inverter control or by energy storage.

Induction charging versus high voltage plug-in charging: at high charging power, the grid must be capable of transmitting the necessary power to the vessel and still keep the voltage quality within acceptable limits given by authorities and local grid owners. The transfer system between landside and ship with a plug solution will normally be high voltage from 3-4 MW and upwards to avoid the bulky cable arrangement and high currents. Parallel low-voltage plugs may be an option, but will increase complexity and reduce operational safety. This must, however, be considered in relation to increased risk for electrical faults in a high voltage transfer system due to demanding environment conditions (salt, dust, rain, shock, vibration etc).

The inductive charging system does not use any type of cable connections; it will be a matter of dimensions for the sending and receiving plate and power electronics. Maximum transfer capacity with a single plate will be about 2.8MW and with parallel plates about 5.6 MW, but can be further increased with larger plates.

One difference between a high-voltage plug-in power transfer system and an induction charging system is the need for power electronics on the landside. The difference in losses between the two types of systems is dissipated here. The power electronics are designed for connection to any landside power source such as batteries, solar etc, and also include control systems that can support the grid with reactive power and cancellation of harmonic currents that will always be present in a charging system.

If power from the grid is insufficient, shore based energy storage may be necessary to support the short use of high power during the charging time. The induction charging system will integrate this in an easy way as the interface is already present in the induction shore unit.

Comparing high-voltage (or low voltage) plug-in systems with induction charging systems, there are operational conditions that are important when considering losses. Available charging time may be 5-20% longer with inductive charging (5-10 minutes docking time), which means that wireless charging uses 5-20% less power and current for the same transfer of energy. Losses are proportional to the current squared, so in this respect losses for wireless charging will be reduced. Less voltage drop involves less losses due to less power and current as above. The sum of these could easily be greater than the additional losses the power electronics will introduce. It is realistic to say that the use of plug charger technology will in large periods give higher voltage drop, and charging periods will constitute a significantly shorter part of the docking time.

The wireless charging system has been successfully proven, both in laboratory tests and full-scale operation aboard the Norwegian ferry *Folgefonn*. This 85-metre vessel was retrofitted for hybrid propulsion in 2014. It makes frequent short-duration stops along its route and cannot operate for a whole day on a single charge. Since manually plugging and unplugging the cables is a time-consuming procedure, wireless inductive charging has shown itself to be a far better alternative. It not only saves time, but by avoiding dealing with heavy and clumsy cables, safety is enhanced as well.