ENACTING ENERGY

RECOVERY IN GLOBAL LOGISTICS

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Energy quite literally makes the world go round, and without it, there wouldn't be much we as humans and consumers could make or do.

Global logistics plays an important and integral role in the world of energy, both in terms of its transport and use, as this industry's consumers have an insatiable appetite for energy.

On average, the 17 million containers around the world each require 160kWh of electricity. This vast amount of energy required to fuel our sector, combined with our growing economic and social responsibility to curtail carbon emissions in light of a climate breakdown, mean that we need to think of novel ways to thoroughly improve the energy efficiency of our operations.

The adoption of alternative energy sources, such as biofuel facilities and solar panels, also has to be discussed. Our industry needs to move forward together towards a greener future, and at DP World Europe, we are pushing ahead with innovation in this space, especially at our facility in Constanta, Romania.

Our Constanta terminal is acknowledged as one of the Black Sea's premier container terminals, serving the Romanian domestic market and with the potential to serve a wider hinterland spreading into parts of central Europe, together with feeder connections to the Ukraine, Russia, Bulgaria, Georgia and Moldova.

DP World Constanta offers importers and exporters in Central Europe quicker access to the Far East market than movement via the traditional routing over North Continental ports.

DP World Constanta signed the concession agreement with the port of Constanta in 2003 and commenced operations in April 2004.

From inception we have been repeatedly awarded as the best port operator in Constanta by the Port Authority and Chamber of Commerce in Constanta.

GREENER AND LEANER OPERATIONS

As a part of our commitment to sustainablity, we've implemented 'Our World, Our Future', a global programme launched by the DP World network to bring sustainability into every aspect of our work.

In 2018, we launched two new pillars building on our commitments and using the UN Sustainable Development Goals (SDGs) as our framework to find innovative solutions to issues threatening the sustainability of our port operations and logistics solutions.

Moreover, an additional challenge for ports is to reduce their operating costs and their CO2 footprint in accordance with the recent International Maritime Organisation (IMO) decision to reduce CO2 emissions by 50% by 2050.

Also, from an economic standpoint, the cost of petroleum products is fairly high, even without accounting for the negative externalities of using them.

CLEAN INITIATIVES

Meeting these objectives requires new and innovative approaches, from downsizing primary energy sources, to the electrification of port operations.

Maritime transport is often pointed out as a highly energy efficient mode of transportation, but incentives for further improvements are constantly adopted by the industry due to the social and economic imperatives to become greener and leaner.

Climate change has recently received more attention in the shipping sector.

This is mainly due to a growing demand for reduced global emissions and the fact that shipping is one of the fastest growing sectors in terms of greenhouse gas (GHG) emissions.

In parallel, ports have started to introduce programmes and policies to address these emissions head-on.

Energy efficiency measures are important to implement in order to decrease fuel use, but significant reduction in GHG emissions can be achieved only by the replacement of fossil fuels with renewable fuels.

On a practical level throughout our ports, we are implementing a huge range of sustainability initiatives, from solar street lighting in Sokhna, warehouse roof solar projects in Dubai, to on-site renewables at our Terminal in Belgium.

Where possible, in an attempt to lower emissions and mitigate air pollution, we are electrifying port yards.

DP World Yarimca in Turkey, for instance, was built with use of electrified rubber-tyred gantry cranes (e-RTGs) in mind.

However, DP World Constanta's unique circumstances meant this was not possible, and a new, innovative approach was needed to meet our sustainability commitments.

ENERGY RECOVERY IN CONSTANTA

RTG cranes are mobile equipment that load and unload containers onto trucks in a sea port terminal.

Conventional RTG cranes are driven by electric motors powered by large on-board diesel generation sets.

There are approximately 8,000 RTG cranes operating at seaports around the world, which contribute significantly to a port's overall emissions and, as a consequence of this, have become a testing ground for new hybrid technologies.

Compared to other energy storage technologies used on RTG cranes such as conventional batteries and ultracapacitors, flywheels do not require routine replacement and therefore offer a predicted lower repair and maintenance OPEX cost, higher tolerance for rapid cycling, and freedom from aging and environmental limitations.

Similar to the regenerative braking pioneered in Formula 1 and now commonplace amongst modern cars, the flywheel energy-storage system, as used in RTG cranes, consists of a heavy rotor — the flywheel — and an electric motor that also serves as a generator.

The motor, via naturally occurring regenerative energy, spins the flywheel up to its operating speed and so stores kinetic energy.

Conversely, the flywheel can transfer rotational energy to the motor/generator, which then transforms it back into electrical energy.

Wasted regenerative energy from container movements can be recycled and then reused in other ancillary operations.

Energy can be recovered when a crane motor brakes, either by exporting via an active front end or storing energy on crane for reuse when lifting the next container.

When a container is lowered, the hoisting motor is not performing any work.

In fact, the lowering motion is being driven by the weight of the spreader and container.

The movement, therefore, has the potential to produce electricity (analogous to a generator).

In a conventional RTG, there is currently no way to gainfully use this generated electricity.

Therefore, the electricity is fed to large resistor banks, converted to heat, and eventually dissipated via direct contact with air.

Studies performed by the Georgia Port Authority on their ship-to-shore (STS) cranes showed that, on average, the cranes generate electricity for 18 minutes during every hour of operation.

The potential for regeneration is expected to be similar for RTG cranes.

Moreover, the need for maximum power on an RTG's diesel engine exists for only 4% of operating time, which implies that if the peak power demand can be reduced, the diesel engine can be downsized.

CRESS'S system can be connected at any convenient point of the DC bus of the crane and AC connection is also possible.

The energy store controller is able to recover energy which would otherwise be wasted and intelligently decide when to take in energy from the primary source at a low rate and giving out energy at a high rate, acting as a power multiplier.

As previously mentioned, the Flywheel technology is being used elsewhere and has been around many years in different guises, even previously used on RTG.

The unique advantage that the flywheel from CRESS has it that it is a bespoke design for the arduous and testing conditions port equipment operate in and can be retrofitted to any brand of crane or electrical drive system.

REFERENCES:

[1] UNECLAC. (2016). Energy consumption and container terminal efficiency. Natural Resources and Infrastructure Division, Infrastructure Services Unit. Santiago, Chile: United Nations Economic Commission for Latin America and the Caribbean.

ABOVE AND BEYOND

In an effort to continue the excellent work our network is doing in this area, DP World Europe will collaborate with a leading UK university to investigate the benefits of using similar technology on straddle carriers, as well as supporting the manufacturer with an opportunity to live test, should the results of the research prove positive.

Following on from the same theme of delivering energy saving to port equipment, DP World Constanta has several additional routes underway, such as working alongside a local developer of electric trains to develop the same technology to fit their internal container moving vehicles and installing a SCADA-based network of electronic water meters and electrical meters around the port.

Our facility in Constanta is at the heart of our network-wide initiatives to create greener and leaner port and logistics operations.

Reducing the energy intensity of our day-to-day operations is of vital importance to us as a business, and to our entire sector.

Without utilising emerging technologies and increasing the rate of adoption, we will fail to secure the sustainable future of our industry and, perhaps, the planet.

If that doesn't get you contemplating energy recovery on RTGs, I don't know what will.

ABOUT THE AUTHOR

Alistair Williamson is the European Regional Engineering Manager, a position he has held for the last four years. Previously, Alistair worked as in a Senior Equipment Engineering role for Hutchison Ports in their Hong Kong office and prior to that at Hutchison Ports UK as the Equipment Technology Manager out of their Felixstowe office. Alistair has a total of 37 years working within the port industry.

ABOUT THE ORGANIZATION

DP World is a leading enabler of global trade and an integral part of the supply chain. It operates multiple yet related businesses – from marine and indland terminals, maritime services, logistics and ancillary services to technology-driven trade solutions. It has a portfolio of 78 operating marine and inland terminals supported by over 50 related businesses in over 40 countries spanning six continents, with a significant presence in both high-growth and mature markets.

ENQUIRIES

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