Going all out for a Green WIN

Climate change is one of the biggest challenges we are all facing and is a top priority around the world: from the United Nations (UN), where Climate Change is Sustainable Development Goal (SDG) number 13, to the European Commission's European Green Deal.

Involvement and commitment of all stakeholders is crucial in addressing the challenges of climate change. This includes Water Management Organisations (WMOs) and Inland Navigation Authorities.

Climate change is already impacting on WMOs' operations and infrastructure. In recent years, summer droughts have reduced canal and river water supplies and winter storms have resulted in infrastructure damages that have impeded navigation and in some cases have led to waterway closures.

As the EU focuses more on reducing emissions from transport and less on the infrastructure needed to increase transport, it has invested in programs to reduce harmful emissions.

In response, several waterway organisations throughout Europe have come together to try to find solutions to reduce greenhouse gases emissions generated during their pumping operations and transition to a low carbon infrastructure.

The result is the project GREEN WIN.

This INTERREG NWE project was approved on 29 May 2018 under the Low Carbon priority with a total budget of 2.45m over three years. The project addresses the problem of excess energy use and high carbon emissions Waterway Management Organisations (WMO's) cause across NWE when pumping water around the region's rivers and canals. The project tackles this by jointly trialling technologies and more efficient ways of deploying them. Pumping water has a big carbon impact across NWE, accounting for 25-33% of annual electricity use by WMOs, and roughly 20% of total emissions.

In numbers, Green Win is aiming for a 15% reduction of CO2 emissions generated at 11 trial sites in Ireland, United Kingdom and France by 2021. This is a reduction of 195 tonnes of CO2. As an often-smaller scale purchaser and user of pumping equipment, it can be challenging for navigation authorities to fully explore the benefits of large-scale investment in emerging technologies. With a high degree of legacy equipment, often poorly selected, with little or limited automation the opportunities presented by the Green Win project is to allow investment which brings environmental and operational benefits.

WHO?

Canal & River Trust in the UK are the Lead Partner and works with five other organisations from the Netherlands (Rijkwaterstaat), Belgium (VLM and Université of Liège), France (VNF) and Ireland (Waterways Ireland) across a range of disciplines. Also involved are some key pressure groups such as Inland Waterways International (IWI), Inland Navigation Europe (INE) and the Network of Inland Waterways Europe.

Involvement from SME's and / or Trade Organisations is key to the project's success and Green WIN is working to set up an Advisory Group to help steer the trials in the right direction, offer practical suggestions, commercial insight and help increase the likelihood of getting greener technologies, systems and processes to market.

The project will share experiences between partners as solutions are explored and with the wider industry. Supported by the University of Liege each partner will deliver projects part funded by Green Win which will explore and evaluate the equipment selected and the 'real world' benefit these bring.

A key part of the project is the involvement of support organisations and SMEs. The project is supported by consultants Arcadis who are providing technical support and reports evaluating currently installed equipment. Aracadis will assist with the selection and design of solutions for each partner throughout the duration of the project. Pump manufactures are being engaged as solutions are developed. Their support explores new equipment as it comes on the market and supports the investment required for installation and evaluation.

As well as manufacturers and consultants the project is working with Inland Waterways International. IWAI provide advocacy for the project helping the partners to achieve wider uptake and greater public awareness of the benefits that Green Win can deliver.

The project is keen to develop new relationships with other organisations and SMEs. Involvement from SME's and / or Trade Organisations is key to the project's success and Green WIN is working to set up an Advisory Group to help steer the trials in the right direction, offer practical suggestions, commercial insight and help increase the likelihood of getting greener technologies, systems and processes to market.

HOW?

In order to measure the project success, baseline data on energy consumption and efficiency, and current CO2 emissions for the selected pilot sites was collated and reviewed to produce recommendations for delivering energy savings and CO2 emission reductions.

Proposed high efficiency or novel solution selected pumps from partner sites will be tested in laboratory conditions at University of Liège's Urban and Environmental Engineering research unit to identify real world performance and technological adaptations needed to reduce GHG emissions by an initial 15%. The trials will allow the team to identify optimum equipment type and configurations for different hydrological scenarios and operational conditions and how existing technologies or energy solutions can be adapted to be applied across all NWE waterways and the wider pump manufacturing sector. These include; Variable speed drives to optimise efficiency; IE3 & IE5 Motors; Smart Pump Control Systems; Automated control using SCADA systems; Smart metering to track electricity consumption at pump stations; Potential of using pumps as turbines ('PAT technology'); Electricity network supply load balancing.

Working with SME's during the laboratory trials to test technology on the market across a range of operational waterway sites will help to find better solutions for Green Win partners.

Equipment, configurations and operational solutions identified will also be tested on site, at the 11 pilot locations across the UK, France and Ireland, with 'on the spot' practical input from SME's to help us maximise the CO2 reduction. If successful these solutions will become permanent installations at each site, enhancing and securing water supplies for the future.

SME's involvement throughout the project will hopefully help find out how existing technologies or energy solutions can be adapted to be applied across all NWE waterways so that emerging technologies are tested at low risk to partners and go on to provide significant benefit to not only the project partners but also across the wider industry.

FIRST PROJECT SITE

In May 2020, the first pilot site in the Green Win project received its new pumping equipment. Canal & River Trusts Tinsley Pumping Station is located on the Sheffield and Tinsley Canal in Yorkshire, suppling water from the River Don to the summit pound of the canal into Sheffield city centre. The station was built in the late 1800s, originally steam powered, it now houses two centrifugal submersible pumps with a duty flow rate of 140 l/sec each. Pumps are automatically level controlled by a local PLC, which is integrated into the Trust's SCADA system. The station has been modernised over the years but the original 1.5 mile long 100 year old cast iron discharge pipework remains.

The station has suffered from very poor resilience over recent years with high levels of duty required to meet supply needs and pump equipment has regularly failed. Typical life spans for submersible pumps here have been 3 to 4 years as opposed to the expected 15 years plus. The impact of these failures has affected the viability of the canal and impacted The Trust customers.

The Green Win Project reviewed the current pumping system and the performance of the installed equipment. Working with Arcadis and SME Samatrix, a day of trials were undertaken at the site to determine system and pump characteristics. Arcadis produced a summary report for the station and working with The Trusts engineers looked at pumping equipment on the market that met The Trusts duty requirements and constraints. Factors such as the ageing pipeline were taken into account and the variations in suction side water levels.

The project team selected two 55Kw Hidrostal F06G-EMU1 immersible screw centrifugal pumps as the ideal replacement for the current pumps. These pumps offered higher duty flow, reducing operating time whilst also having much improved NPSH compliance and solids handling. The project has been supported by Hidrostal throughout with the company providing technical support and reviewing the system information gathered by Arcadis.

Installed by The Trusts MEICA Framework contractor AmcoGiffen, the works included modifications to the existing wet well to best suit the new Hidrostal pumps. The works were complicated by the unexpected failure of the 100-year old cast iron pipeline, just before the new pumps were due to be installed, at a difficult location half way up the lock flight. Emergency works were undertaken by the Trusts principal civils contractor Keir to locate, excavate and repair the pipe fracture supported by the Green Win project team.

Repairs to the pipeline have been completed over a period of 4 weeks in the middle of the COVID 19 restrictions. Towards the end of repairs and with large-scale temporary pumps installed close to Sheffield city centre, it was realised that there was an opportunity to install the new pumping equipment. Working jointly with The Trust and Keir, AmcoGiffen successfully installed and commissioned the new pumps in 4 days at the beginning of May 2020.

The pumps performance will now be evaluated, and the benefits measured as part of Green Win. The project will look at what others benefits may be achieved for the site now that new pumping equipment has been installed, such as the installation of Variable Speed Drives to modify and adapt the duty point to best suits intake and feed requirements.

MORE TO COME.

Green Win is only the start. In order to extend the CO2 reduction across Europe, WMO's outside the partnership will be encouraged to install equipment and use configurations / processes demonstrated by the pilot sites to follow a 'Code of Conduct'.

To assist WMO's make the transition to greener infrastructures, Green Win is working on developing a 'Greener Pumping Toolkit', which will help WMO's take practical steps in relation to investment and procurement for their pumping requirements. This Toolkit based on all of the partners learning from throughout the project, will be available to any WMO who is looking to improve on the selection and installation of pumping equipment.

As well as the Advisory Group, a Greener Waterways Network, will be promoting the strength of the results achieved through Green WIN and greener technologies for inland waterways.

Efforts will be made at EU level to get greater recognition for inland waterways. With Green Win's results demonstrating energy and cost efficiency as well as practical scientific evidence of CO2 reduction, a case will be lobbied to EU policy makers to support development of EU policy in the area of waterway infrastructure, hopefully leading to legislation improvement insisting on pump replacement with CO2 reduced / neutral pumps.

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