

Project title: Development and demonstration of a novel automatic blowdown system for steam boilers

Main applicant: Spirax Sarco Ltd UK

Technology developer: Spirax Sarco Ltd UK

Industry partners: Bakkavor Meals Wigan and Martec Ltd

Research partners: University of Nottingham

Demonstration capital cost: £583,784.74

Funding Awarded: £270,167.00

Project Timeline: February 2019 – March 2021

Project Description: Steam boilers are widely used in a variety of industries. The accurate control of total dissolved solids (TDS) is required to avoid scaling, excessive boiler blowdown and poor-quality steam. Spirax Sarco, along with the University of Nottingham, have developed a new type of TDS measurement probe for industrial steam boilers, that is expected to be more accurate and less prone to fouling than existing systems. Traditional TDS probes measure the electrical conductivity of the boiler water to reduce TDS levels, which are then used to control the amount of boiler water that is blown down to reduce TDS levels. The new TDS probe which is to be demonstrated in this project, is expected to show improved measurement performance, accuracy and immunity to fouling of the probe than traditional TDS probes used for TDS level measurement and control in industrial steam boilers.

The new TDS probe technology integrated with a controller and a control valve automatically controls the TDS level in steam boilers whilst optimising boiler blowdown. The system aims to reduce the amount of fouling on boiler heat transfer surfaces and minimise losses due to excessive boiler water blowdown, improving boiler efficiency. The new probes are also expected to require less frequent re-calibration reducing maintenance requirements and cost.

The University of Nottingham has supported the research and development phase, and a prototype has been tested on a small-scale steam boiler demonstration rig. This work has shown much closer control of the TDS level of the boiler water when using the new probe over conventional TDS probes.

This demonstration project will finalise the design of the new probe, developing an industrial scale prototype for installation on an operational boiler at Hitchin Foods. The demonstrator site has multiple boilers, therefore the demonstrator will determine comparative performance as well as before and after performance in each boiler. It is expected that once the new TDS probe is fully commercial, the payback for implementation in place of a conventional probe is anticipated to be under 1 year.

Size of target market: Steam boilers are widely used by industrial companies in the UK, all of which currently use manual or automatic TDS control using traditional conductivity TDS probes. The potential market for the improved TDS probes and the associated automatic controls is therefore significant.

Spirax Sarco initially intends to focus on the estimated 10,000 steam boilers in the UK roughly split between industrial companies and commercial applications, where a good proportion of the installations could adopt the technology.

Barriers to market: The new TDS probe challenges the status quo of existing TDS probes which have been used in steam boiler applications for decades. In general, the industry is conservative with unproven methods that require investment in equipment. Therefore the barriers to adoption of the

technology, which is currently at prototype development, are primarily that it is unproven in an industrial environment. Reliability of TDS measurement is an imperative in a resource challenged environment. The aim of the demonstration project is to overcome this barrier and demonstrate to users and regulators that this can deliver significant performance improvements, offer savings in water and energy as well as to show that the technology is commercially viable.

Initial TRL: TRL 5

Targeted final TRL: TRL 8

Estimated energy and carbon savings: The energy savings have been estimated at 5-6 per cent of boiler fuel consumption at the demonstration site, arising from reduced scaling improving heat transfer and reducing the volume of blowdown required. Additional benefits may arise from reduced need for chemical additives to the boiler water, reduced frequency of probe re-calibration and the production of higher quality steam.

Why IEEA funding was important to this project: The IEEA funding gives the project additional financial support, expands the scope and improves the scale of project partnership and collaboration. The additional funding and strategic partnership increases the amount of work that can be accomplished through the project and speeds up the product development timeline. The project will also benefit from support from the IEEA programme, in terms of development of a case study utilising performance data and incubation support for understanding the most effective strategy for communicating the outcomes of the innovative technology.