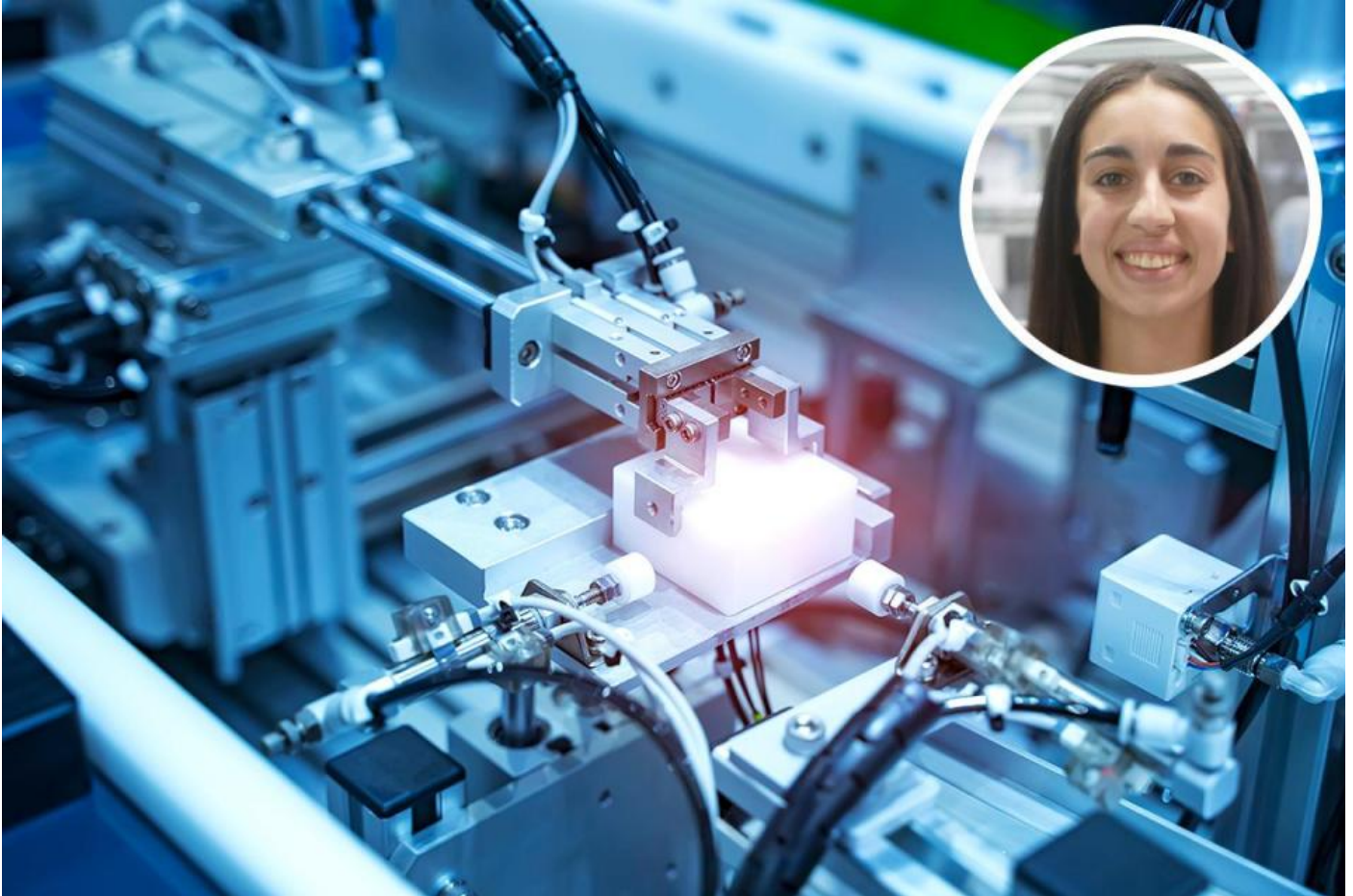


## Artificial Intelligence for sustainable compressed air systems

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Inset: Jasmine Mallia

‘Artificial Intelligence’ and ‘sustainability’, have become part of our daily jargon and can easily be noted in adverts, on packaging material, clothing, and many other consumer products and services.

Nonetheless, what does it really mean to implement intelligent techniques to obtain a more sustainable operation within the manufacturing industry?

This is where the project Air Save comes in, as it aims to develop a smart system to improve the sustainability of compressed air systems. We all encountered compressed air in our lives, such as when inflating balls and vehicle wheels, or when using spraying applications. In the manufacturing industry, the use of compressed air is extensive as it is used to power many different devices such as automation systems. However, they tend to suffer from numerous faults.

The hissing noise of a damaged air pipe or fitting is unfortunately very familiar.

This results in energy being wasted in order to generate more compressed air to keep up with the loose connections, leakages and pressure drops, amongst others. The problem with air leaks, is that unlike water leaks, these can easily be ignored. The Air Save project aims to address this issue, by particularly focusing on the end use of such systems, such as the air distribution network and end actuators. A typical manufacturing setting consists of a limitless number of end-uses within machines, workstations and other processes.

Air Save does this with the use of an Industrial Internet of Things system, thus automating performance monitoring both from an environmental and a financial aspect. This allows for data (such as pressure, flow rate and system’s cycle time) to be continuously

collected, managed and analysed in real-time by intelligent means.

Thousands of data points are collected every minute, making it very complex to analyse. The human mind cannot comprehend such large amounts of data in a short period of time, to deduce relationships, or identify the changes occurring from the required set points and parameters.

In this case, Machine Learning algorithms are capable to identify and classify the leaks, from the complex relationships intelligently extracted from typical manufacturing parameters. With the use of data processing techniques such as statistical methods, the processed dataset can be fed to the selected Artificial Intelligence technique for the required intelligent analysis. So far, Air Save has implemented classification methods, where the faulty scenarios are distinguished through the automated classification and categorisation.

Apart from automating fault finding, Air Save has also developed an innovative way to automate and control the system's behaviour in case of a present fault. Air Save uses an intelligent algorithm, in this case, swarm intelligence, to search and provide the ideal control solution to mitigate the effects of faults while maintaining the manufacturing productivity. With the correct control equipment, full automation for the deployment of such a control action can be achieved.

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Air Save actively pursues the use of Artificial Intelligence and the sustainable pillars to go hand-in-hand. The intelligent methods detect and identify the faults in real time, which produce the required immediate maintenance action to mitigate the effects of such faults. The financial aspect is also catered for during automated control of the faulty system such that the productivity is maintained close to the user requirements. Apart from this, the intelligent techniques reduce the load on manual fault finding, which is typically carried out using ultrasonic tools or other traditional and cumbersome approaches. The proposed AIR SAVE system, which is being developed and tested in real manufacturing scenarios, is not only providing a better maintenance approach, but also expanding sustainable benefits across the manufacturing industry.

The Air Save invention has been filed with the UK Intellectual Property Office and is currently in 'patent pending' status.

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