

James Dawson Shanghai Uses AI and Robotics to Improve Hose Wrapping and Safety



Each year, the Dawson Polymer Products facility in Shanghai, China, manufactures two million silicon polymer flexible connections, used in diesel engines, for heavy duty transportation equipment. The facility is part of James Dawson Engineered Hose Solutions, a brand of Fenner Precision Polymers, a Michelin Group Company.

Until recently, wrapping those hoses (which sometimes stretch five feet or 1.6 meters in length) with a silicone sheeting, the vital production process for ensuring its designed shape and quality prior to being heat cured or vulcanized, was a time-consuming and labor-intensive process. Workers who did the wrapping navigated ergonomic challenges, not to mention capacity issues around holidays, vacation, and sick time.



Some of the barriers to automating the process using traditional methods were that the hoses tended to vary in length, had complicated angle configurations, and various tension controls for different sections of the product. The wrapping band had to be spaced with a designed width and the tension had to be applied adjustably around the bends and angles in the hose. This would ensure the proper tension was applied for shaping and not impact the surface from too much pressure.

Pan Feng, General Manager and Xu Jian, Head of Technical and Quality at Fenner's China division, began exploring the use of innovative robotics to do the wrapping process. To ensure the new automated wrapping system could maximally simulate the present production process with the pre-designed parameter, the team worked directly with a hardware and software collaborator. The collaborator shot video of the workers doing the manual wrapping, then applied a system integrator, using artificial intelligence (AI), to program and control the movement of Fanuc's robotic arm, synchronizing it with the CPU controlled wrapping head during the wrapping process.

THE PROJECT HAS BEEN A MAJOR SUCCESS, ENABLING THE DAWSON FACILITY TO:

- **IMPROVE QUALITY**, by more continuously and accurately implementing tension control and spacing of the wrapping band on the hose and cutting waste by 70%.
- **MANAGE PRODUCTION KNOWLEDGE**, from the programming of the new equipment, through mastering the know-how used by workers to understand programs and parameters, to the thought leadership stored and managed by the business.
- **BOOST EFFICIENCY**, by keeping the machines running continuously with 2 shelves, which can address capacity challenges caused by fluctuating customer demand.
- **ENHANCE SAFETY**, by eliminating the risk of ergonomic-related injury to workers during the hose wrapping process. In addition, the robotic work cell was designed with enhanced safety features to limit entry and prevent operation while a worker is in the cell.

"It was a win-win situation all around," said Carolyn Ruch, Divisional Director of Health, Safety and Environmental. *"Pan and his team not only increased efficiency and quality but also made it a safer working environment for our team members."*

The robotics project can currently wrap up to 15,000 - 20,000 pieces of flexible connections, subject to shape and length, per month. It will be expanded in a second phase of development to accommodate additional manufacturing challenges, as well as demand on small to medium bore sizes. *"Fenner is also looking at it as a solution for production of 3D-shaped flexible connections used for waste-gas collection systems, which is currently driven by the new gap-exhaustion legislation in China,"* Pan said. *"The technology will also be applied to other processes in this facility and globally for Fenner Precision Polymers."*