Project Title:	'Improvement of Energy Efficiency of pneumatic systems by recycling exhaust compressed air'
Principle Investigator:	Dr J Wang
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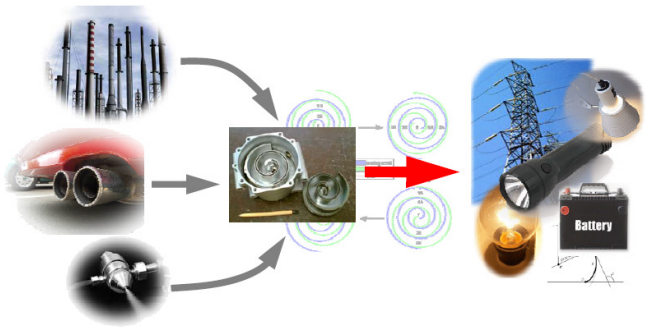
Pneumatic systems are commonly used in industries as varied as automotive, aerospace, biotechnology, pharmaceuticals and food processing. They are so commonly utilized in industry because they have a number of distinct advantages: they are environmentally friendly; have a high load-carrying capacity-to-size ratio; they are mechanically simple; low cost; and easy to maintain. In the UK over 10% of National Grid output is used to generate compressed air, in addition around 20% of electricity supplied to manufacturers/factories is used for this purpose. However the energy efficiency of pneumatic systems is low with a report by the British Fluid Power Association (BFPA) indicating that, in the UK and other European countries, an energy efficiency of between 23%-30% is achieved in working systems. Another report also indicated that the energy efficiency of pneumatic system is even lower than 20%. It is considered that such low energy efficiencies are mainly due to the open-circuit structure of pneumatic actuator systems. Some efforts have been made to improve energy efficiency of pneumatic actuators such as avoiding air leakages and reusing the exhaust compressed air. In spite of this there are still no suitable mechanisms to recycle energy lost at the exhaust, therefore there is considerable scope for research in this field.



Research on improving the energy efficiency of pneumatic actuator systems has been carried out for over seven years at the University of Liverpool. Early research has shown that around 3% energy could be saved by connecting a by-pass valve to partly recycle exhaust air. An improved control strategy has also been developed for some pneumatic systems, which is based on an idea of saving energy through better controls and can save between 1.5 to 2% of compressed air. Dr Wang and her research team are also working on using the highly efficient scroll type air motor in pneumatic systems to help recycle the exhaust air in order to generate electricity. This motor is currently widely used in air conditioners and refrigerators because of its efficiency and compact nature but has only recently been converted for air motors. They have created a test system to simulate the use of this motor as an air-electricity transformer to recycle the pneumatic systems exhaust air and experiments have shown that around 20~50% of exhaust air can be recovered using this system.