



JAMES DEVEREUX MANAGING DIRECTOR AT PSI TECHNOLOGIES LIMITED

James is the Founder and Managing Director of PSI Technologies Limited (2003), a 25-employee strong electro-pneumatics company, and sister company Transportise Limited (2022), a vertical with bleeding edge Industrial IoT capability specifically within rail. James is a true entrepreneur, who with his team, is devoted to a vision of combining the very latest IoT and AI technologies, with robust engineering capability to improve the UK rail offering.



PSI TECHNOLOGIES LIMITED

PSI Technologies is an innovation led, engineering solution provider. We work in collaboration with our customers to innovate, resolve technical challenges and enhance opportunities with a goal to bring tangible benefit to their business.

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PSI Technologies?

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How did you get started in the industry?

Unconsciously as a young engineer, my first ever job was directly related to the rail industry. Working in the quarry and mining industry, part of my role was to evaluate and grade sand for commercial use. Unbeknown to me, the 10/18 sieves gave the specification of the GMRT2461 braking sand, used extensively for WSP on the current UK network. My key role however was the specification of valves and actuators, which is where my interest in Electro Pneumatic Technology started.

From the process industry I moved into agricultural vacuum tanker systems (this becomes rail relevant later in my career working on Rail C.E.T systems) and then onwards to SMC Pneumatics in my mid 20s. SMC Rail Transit was working on the Boston blue line door systems at this time, and the sight of the door rigs and the explanation of their operation must have left a lasting impression on me, as one of our sustained projects today as PSI Technologies, has been rail door systems.

What is your Unique Selling Point?

PSI's unique selling point is a combination of our broad domain knowledge of vehicle air systems coupled with the ability to leverage the latest technology to improve rail vehicle operation. We also consider not being overly constrained by corporate structure or legacy engineering to be a USP, with an approach of 'if it can be done, it will be done,' and we are not afraid of certification. If the product is right for the application, then EN50155 is never a barrier to implementation.

What types of products and services do you offer?

PSI are a specialist rail engineering company focussing on Electro pneumatic, Electronic and Vacuum systems on vehicles. We are experts in supplemental on-board control systems - from upgrading legacy pneumatics to a solid-state safety system for passenger doors exterior, through to complex TCMS integrations like adding bio reactors to the class 334 for instance. The products and services PSI offer have developed extensively over the years to fully embrace IoT in the industrial and transportation sector, while retaining a deep domain knowledge of the core vehicle air system components. The service aspect lies in value engineering, due to PSI's skill base encompassing design engineering, electronics, and control panel build.

PSI's expanding knowledge of full stack IoT solutions has grown to such an extent that a sister company to PSI Technologies has been formed - Transportise Limited. Rail IoT solutions have been developing and incubating for several years within PSI and with the launch of Transportise comes Technology Readiness Level (TRL) 9 projects, in the form of a Rail Freight WSP solution

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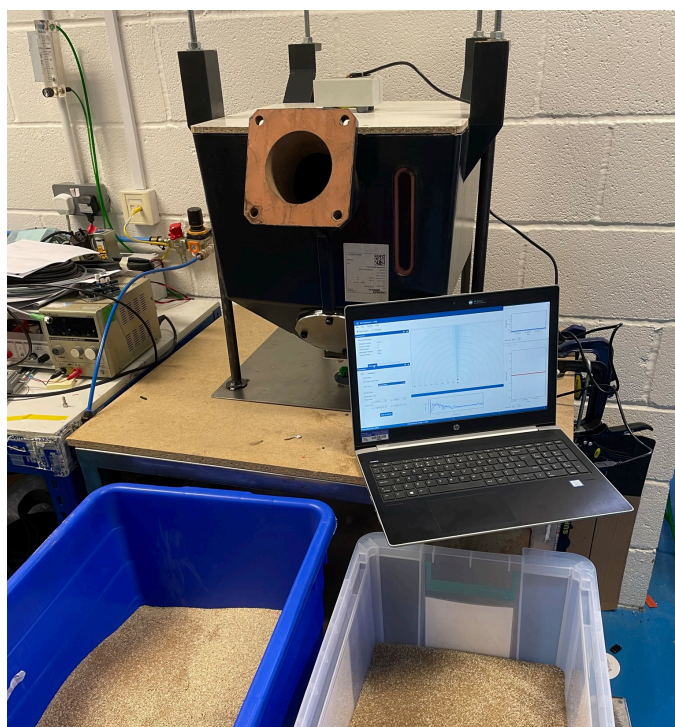
and a sandbox level monitoring solution and intelligent door systems; all three of which presented a huge and sustained challenge. Working in partnership with other experts in the rail sector, one is fully deployed (600 systems) and the two others have reached a convincing breakthrough point.

How passionate about sustainability in the rail sector are you?

There are three main pillars of sustainability - environmental, social, and economic - often referred to as the Triple Bottom Line or people, planet, and profit, so it really extends beyond the sourcing of materials.

At the core of both businesses is adding new life to legacy platforms, enabling older rolling stock to work better and stay on track longer. This means fewer disposable consumables. In the case of EP valves, we are designing solutions to 'end of life' of the fleet, negating the need for historic type of C6 dispose and renew. IoT contributes massively to this quest with remote condition monitoring and active performance monitoring, moving from time-based maintenance programmes to replace as necessary. This technology even extends to low-cost consumables like HVAC pleated filters - why replace something that does not need replacing? By monitoring the differential pressure, we can call for replacement when required. This positively impacts the environment and reduces waste.

IoT solutions in rail reduce consumption of energy. Its very essence is to drive efficiencies and minimise, if not eliminate, wastage. When you seek to improve a situation with a new solution, which is what PSI does, there is invariably a positive environmental impact, if you take, for example, PSI's sandbox monitoring solution. PSI also have a new initiative still in development - improving the sanding system altogether to minimise the pollution and environmental damage that sand deposits have. The sandbox solution has a crossover, albeit small, with social,



in that unnecessary man hours spent checking sandbox levels is digitally replaced, allowing human capabilities to be put to far better use.

IoT solutions in rail are also directly impacting on board vehicle air quality, with sensors in HVAC systems to monitor efficiency and a new development using Ionisation technology (recently deployed in trams in Spain). This is another cross over with social, in that it has a direct impact on quality of travel and work, for passengers and staff.

PSI and sister company Transportise contribute to a sustainable economy by being lean, clean, and efficient businesses, run on a no wastage basis. In PSI's view, sustainability is a mindset, an awareness that is inherent, often manifesting itself in a desire to solve problems that positively contributes to environmental, social, and economic sustainability. This is what PSI and Transportise do.

What are some major projects that you are working on?

The first is our Sandbox Monitoring Solution. PSI have developed a completely new remote monitoring system using point cloud technology to continuously read sand hopper level and position of the vehicle on track to an accuracy of approximately 10-30 cm. This involves the integration of all wireless hardware and telemetry, as well as bespoke data integration to the rail company's specification. This goes beyond remote condition monitoring and data transmission due to unique and harsh conditions within a sandbox, so a novel technology mix was required to get the high degree of location accuracy, in addition to building a closed loop control system



which can be added to the vehicle without removing the sand hopper, fractionalising the installation time and cost.

Secondly, I want to highlight Digital Twinning of Dumb legacy Freight. PSI's telemetry innovation has contributed to a breakthrough in a Freight Driver Alert system designed to prevent derailment in freight trains. A much strived for proof-of-concept milestone has now been attained, working with our rail partners and company behind the initiative – Knorr Bremse. Wheel flat prevention activity and data is being successfully transmitted to the driver and when you consider that this is an IoT solution on a dumb, unpowered, legacy, unconnected freight train in motion, it really is innovation in the truest sense of the word. We look forward to reporting on further developments in this area, as part of

the broader project team, as we step closer to a mission critical predictive maintenance (PdM) solution.

What are your standout projects you've been involved in over the years?

Expert knowledge in train doors is a result of 20 years' experience to include over 8,000 door safety valve assemblies (control bypass and door isolation) for a number of fleets. While continuing to innovate in both pneumatics and Industrial IoT, PSI still excel in train doors to this day, a more recent standout being a complete turnkey test solution for a rail company, to test train door lock assemblies in-house. The PSI built test rig, incorporating a clever counterbalance within its mechanical design, and sophisticated electronics, completed

over 60,000 test cycles, going well beyond customer expectations.

Contactors are another highly regarded specialism of PSI, highlighting key partner MAC's valve technology and PSI's sophisticated manifold build. Due to the extremely specific exhaust flow and reaction time required by this application, the MAC valve is the only choice in terms of its unsurpassed high repeatability.

It was the deep domain knowledge of pneumatic valves that catapulted PSI into the limelight with the Government's 'ventilator challenge' during the first outbreak of Covid, working alongside Dyson Technologies to build a solenoid valve that would 'fit' the ventilator and then produce and ship in their 10,000s during lockdown. This is indicative of the mission critical project work that PSI can be called upon to do.

When a client comes to you with a particular problem, what's your process for helping them deal with that problem?

Deep dive collaboration is ingrained in what we do, and our business success depends upon working in partnership with our customers and suppliers to develop the optimum solution. We live a 'blue ocean


methodology' in our approach to projects and often create new products on a project to product approach. While collaboration comes naturally to us, we also have a quality control process developed to meet the requirements of ISO 9001 and which now enhances our customer and supplier relationships. With Cyber security at the forefront of our IoT quest ISO 27000 also plays its part. PSI are approved for design and installation of wireless IoT on the MOD estate, so this type of accreditation really helps in proving our capability to the rail industry.

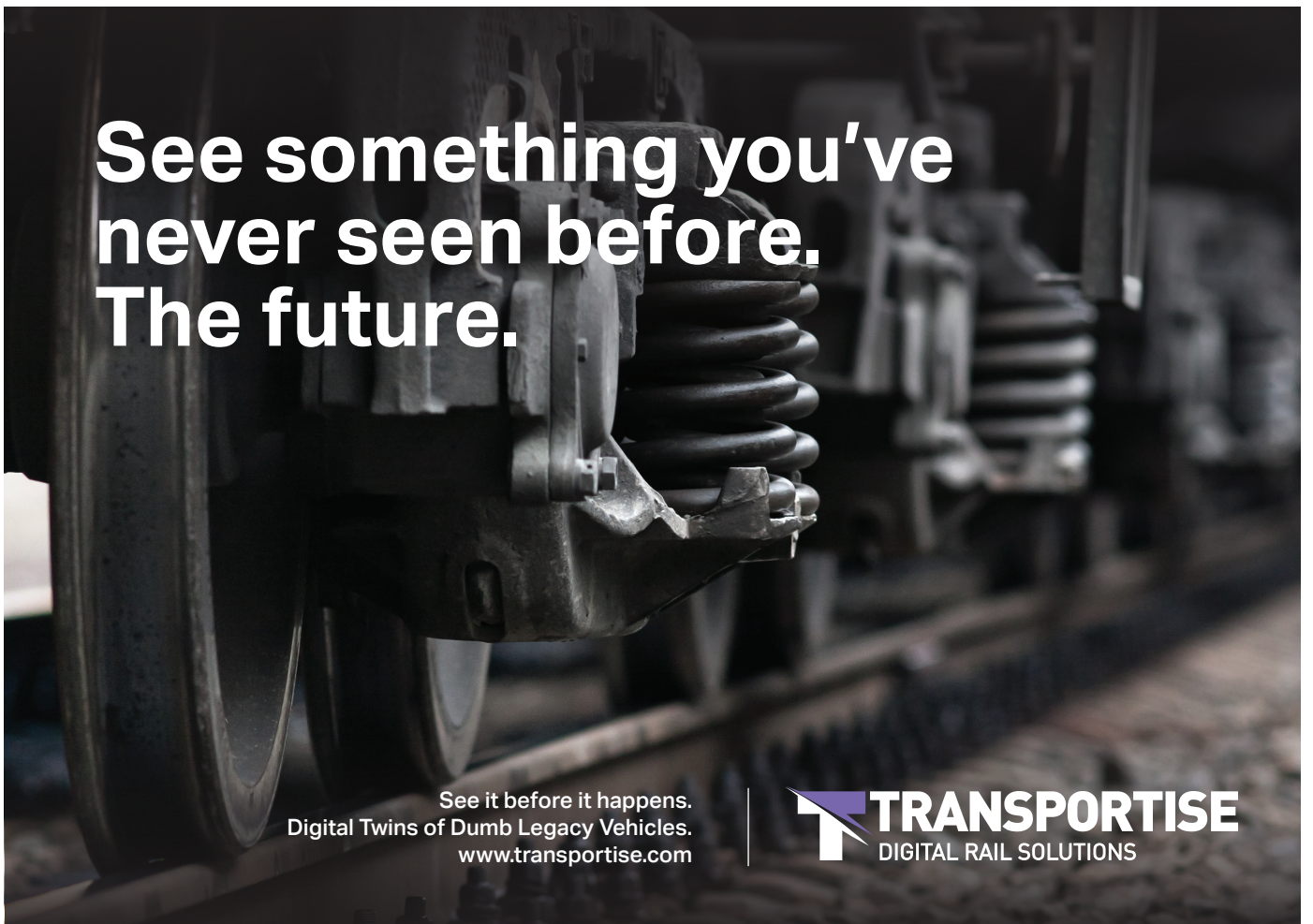
What would you say is the most exciting technology in the industry?

I would have to say Complex digital twinning. A digital twin is a digital representation of a physical object – typically disparate or legacy – and in the rail industry, this covers train stations and maintenance depots as well as all rolling stock. PSI's business is to connect the fringe or legacy asset and bring it into the mainstream as a digital twin. Here, the data it produces can combine with big data, for insights previously unimaginable. Digital twinning can be simple or complex and PSI offer both.

Complex digital twinning takes the out of the box digital solution and integrates it with other data sources, be this a TCMS or any other big data supply, from weather data to mapping data. The IoT Data is Near Real Time because our solutions have the benefit of being wireless, simplifying and reducing installation time and cost. The real breakthrough is aggregating data sources using unlicensed spectrum to reduce the cost. PSI can combine the data from over 1,000 sensors on to just ONE SIM card, making previously economically unreachable assets affordable for IoT.

How can we get more use of the rail assets and what is your vision of rail in 10 or 20 years?

10 or 20 years is a universe away in terms of technological development, but our vision for PSI within the rail sector is to offer a uniform price and technology to connect any 'thing' anywhere in the UK rail network regardless of application, legacy, telemetry, age, or location. The Sandbox solution is just one example of how the Transportise team utilised its own expertise to create a solution that had not previously existed, replacing a labour intensive 'mandraulic' system with a highly optimised alternative. 



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