

Welcome to the **AEGIS** AUTUMN NEWSLETTER



Welcome everyone to our Autumn Newsletter. Autumn always reminds me of “change” as we transition from the summer heat (ed: really?) to the winter chill. Our trees put on a spectacular display of yellows, oranges and crimson as nature begins to cope with less sunlight. On a personal level this brings on an unwelcome change as my Saturday mornings are now spent raking leaves in the garden.

Autumn’s seasonal change is of course dwarfed by the global climate change and this has been pushed to the fore of all our minds lately as global leaders met in Glasgow at COP26. It was great to see the spotlight on our industry’s efforts to deliver a greener railway for passengers. Decarbonisation has been an industry

watchword for some time as we work towards a net zero transport system. For AEGIS it was particularly heart-warming to see the battery and hydrogen technology we are working on represented so well.

As I mentioned in the Spring Newsletter there has been a change of ownership at AEGIS as a result of the acquisition by the Ikos Group. We are nine months in and whilst normal day to day business is largely unaffected, we are enjoying getting to know our new partners and sharing best practice. The relationship offers greater opportunities for our teams; indeed, we recently sent a small team to Paris to the Ikos Lab which includes, amongst its many innovative projects, an ETCS simulator. Ikos have been successfully using the simulator to deliver an ETCS training masterclass to their signalling consultants who then apply that expertise to multiple projects across Europe. AEGIS is already leveraging the Ikos experience on ERTMS projects in Europe to support ETCS projects in the UK. Please get in touch if you have a current or future ETCS need.

Finally, still somewhat precariously on the topic of change we recently ran a recruitment evening for those interested in a change of career. We had a fantastic turnout and have already added some great people to our AEGIS family. With significant growth plans we are continually looking to recruit and develop the best in our industry so please get in touch if you fancy a change!

Mark McCool

Some Current Highlights

Glasgow Subway ISA Project

The Strathclyde Partnership for Transport is implementing a modernisation programme of the Glasgow Subway covering:

- Construction works for improvements and the integration of associated equipment
- New rolling stock and the integrated signalling and control system, which is Communications Based Train Control, which will be replacing the current trains.

Stadler Rail is manufacturing the new trains that will eventually operate driverless in Unattended Train Operation Grade of Automation 4 (GOA4).

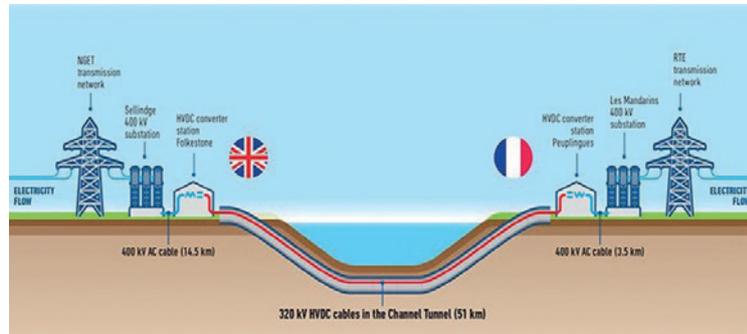
AEGIS Certification Services has been appointed by Stadler Rail as Independent Safety Assessor for the activities leading from final approved design to the completion of phase GOA2, which will form the basis for the subsequent phase GOA4.

ACS is also carrying out the Independent Safety Assessment based on the principles of the risk management process of the CSM-RA for the development of the system definition, hazard identification, analysis and evaluation process and will record the conclusion within a Safety Assessment Report.

The ISA team undertook an audit in Glasgow to inspect the unit, test site and interview key personnel with a view to assessing whether suitable systems, procedures and controls are in place to facilitate the safe operation of the unit on the Glasgow subway mainline infrastructure for test and commissioning activities.

SPECIAL PROJECTS

Eurotunnel Group has established a company, Eleclink, to install a high voltage interconnector within the Channel Tunnel infrastructure between France and the United Kingdom. The interconnector will enable energy transfer between the two countries, with a capacity to provide electricity for more than 1.6 million homes. Eleclink will operate and maintain this 1000MW High Voltage Direct Current (HVDC) interconnecting cable over a 30-year period.



The new cable will be constantly energised, including during routine tunnel maintenance works. Consequently, Eurotunnel is procuring new On Track Machines and maintenance modules incorporating high integrity Movement Limiting Devices to prevent contact between the plant machinery and the HV cable. We are proud to be supporting Eurotunnel on several fronts in this project:

- Managing the acceptance approvals of the new equipment to ensure it complies with the latest standards. This is a complex area of work involving a combination of UK, European and Eurotunnel Standards.
- Safety assurance by implementation of the Common Safety Method on Risk Evaluation and Assessment (CSM-RA). This regulation sets out the legal obligations for assessment of risk of changes on the railway. Our specialist engineers are bringing a structured approach to assess all risks associated with the introduction the new On Track Machines maintenance modules.
- We are also helping Eurotunnel directly with a permanent Resident Engineer who is on hand to support the procurement, approvals and safety assurance activities. The Resident Engineer is also pivotal to managing the interface between the existing flat wagons and the new modules. Furthermore, the testing, commissioning and Eurotunnel Product Acceptance process is being supported by AEGIS to ensure a smooth and efficient introduction into service.

At the end of the process, once compliance to project defined standards have been established, AEGIS will issue acceptance certification. Independent Competent Body, Independent Safety Assessment and CSM-REA Assessment Body services are also being provided to ensure all safety related matters are independently reviewed and meet relevant legal obligations.

The new On Track Machines maintenance modules will be supplied by GOS Tools and Engineering Ltd. GOS will procure specialist equipment from Palfinger, Zeck and other suppliers and will manufacture the new modules, which will replace the 20+ year old legacy plant machinery. This will be for all infrastructure sectors within Eurotunnel, including Permanent Way, Civils and Overhead Catenary Systems (OCS). The new modules have been designed with environment and emissions as a high priority and power will be derived from on-board battery technology.

GOS are supplying a total of 7 (plus various variation) module types – here are a couple of examples:



30' ISO module with Palfinger PA200 Mobile Elevated Work Platform (MEWP) and wire handling device mounted above the electric hydraulic power unit



30' ISO module with Palfinger PR220, fitted with a MEWP basket to support OCS and Civils works. The MEWP attachment can be removed to allow conventional lifting duties, with the deck space between the electric hydraulic power unit and the crane utilised for the storage of infrastructure material.

The AEGIS team delivering the engineering support to this complex new modular fleet of equipment are Andy Batters, Steve Turner and Ozi (Othaman) Al-Jumaili.

These railway engineers have over 50 years of combine experience with On Track Machines and railway plant and look forward to a successfully delivery and safe and compliant introduction to service of the new GOS equipment on to Eurotunnel infrastructure.

Holistic Test Automation

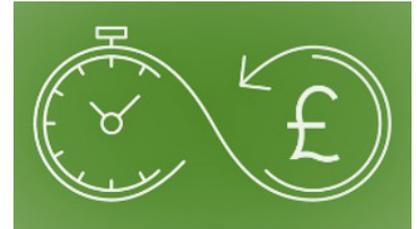
Automation is taking over many aspects of engineering projects. Apart from enhancing productivity and product quality, automation also makes life easy for delivery teams in many ways. Today's rolling stock and infrastructure systems have various on-board and trackside subsystems, interfacing with each other to deliver safe and reliable solutions. The industry is gearing up for the digital transformation journey, and we are ready to ride the digital wave which means – more than ever before – smart, digital, intelligent and automated solutions.

In this article, we will share our insights into defining and deploying a successful and holistic test automation strategy to reap the maximum Return on Investment (ROI). First, let us understand this term. ROI is "the benefits realised by automating the manually executed tests over a period of time". An automated test takes less time to be executed, as compared to performing the same test manually. This saves more and more time cumulatively, every time the automated test is executed. The ratio of the total savings realised against the investments we make for automation, is the true ROI.

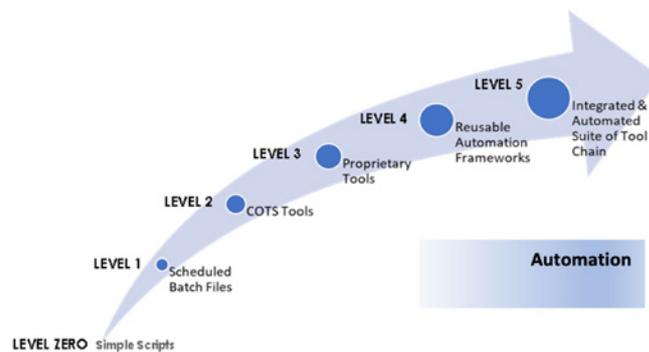
Levels of Automation

Before we dive into the holistic automation strategy, we need to ask ourselves a few questions that will help us demystify the strategy we need to adopt:

- Where are we currently in the journey of automation?
- What is our end goal? What are we trying to achieve through automation?
- What tools and technologies are we planning to use?
- Are we going to build something new, or just buy a ready to use solution from the market?
- Do we know our current test productivity and test coverage data?
- What is the timeline we have in mind for introducing automation in our projects?
- Do we know how much it is going to cost? Do we have a target ROI in mind?



Project teams and organisations start their automation journey because they want to achieve higher levels of productivity and quality. First the teams need to decide on the level of automation they want to achieve. Automation can be done at various levels, and we can define an Automation Maturity Continuum, as depicted in the illustration below.

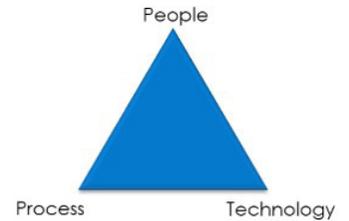


The team needs to understand the different levels of automation and decide the most appropriate level for them to start their automation journey. We will see how these levels of automation differ in the maturity.

- **LEVEL ZERO – Simple scripts:** The first level of automation is to write simple scripts that can automate manual tasks to save time. These could be simple Visual Basic Macros in Excel spreadsheets that automate laborious, repetitive tasks. Often such automation scripts are written by a single person or a small group of people, wanting to make their life easier. There is not much thought put into the reuse of the automation script, and how it can be enhanced or maintained in the future.
- **LEVEL 1 – Scheduled batch files:** At this level, some planning and thinking is applied for executing the automated set of scripts, to perform a specific set of actions. Often these are batch files scheduled to run at a specific time. For example: A set of automated scripts that mirror two databases at midnight when there are least number of expected online users.
- **LEVEL 2 – COTS tools:** At this level, there is considerable thought and money involved. The teams decide to buy a Commercial Off The Shelf (COTS) automation product or tool to automate a specific set of tests or functionality. These are standard industry tools – for example, a tool that can record a set of user actions. Later, the team can play out those repeated actions in an automated, way to perform simulated user actions for testing purposes.
- **LEVEL 3 – Proprietary tools:** This is typically done by companies that have proprietary hardware and software systems that are not compatible with standard industry COTS tools. This involves strategic thinking and planning to design the bespoke automation solution to test the company's products and systems. Such bespoke automation must be architected and designed to be reusable, maintainable, and extendable to test different products that the company develops, to enhance the ROI.
- **LEVEL 4 – Reusable automation frameworks:** At this level, a company is very mature in the automation journey, extending and integrating the bespoke automation tools developed for various purposes. This results in a "Reusable Automation Framework", which is a collection of automated test tools that can be configured and used across different product families. Automotive companies have efficient and effective automation frameworks, which they use, for example, to test and validate the car infotainment and HMI systems across various trims or models of their product lines.
- **LEVEL 5 – Integrated and automated suite of tool chain:** This is the epitome in automation, with seamless integration across the life cycle phases, and not just the testing phase being automated. The team is very mature with refined engineering life cycle processes and having an automated way of working. Right from the system requirements to the system validation phase, all the different tool chains are seamlessly integrated, making it easy for the teams to do their jobs. Higher levels of productivity and quality result from less rework and better change management due to linkage between life cycle phases, making the team more dynamic and adaptive to changing customer needs.

SPECIAL PROJECTS

Once the team has clarity on the right level of automation and has answered the questions discussed above, they can start formulating an automation strategy. A key best practice for ensuring a holistic test automation strategy is to evaluate the impact of automation on the People, Process and Technology. How will the automation impact the “People” in the organisation, what “Processes” need to be changed, and what new “Technology” will be involved. What training needs to be provided to the teams, etc. Assessing the chosen automation strategy from these three aspects helps in formulating a holistic approach towards test automation.



Challenges faced in automation initiatives

Automating test processes is not a simple matter; teams will face many challenges on the journey. Here are some typical challenges, along with best practices that have helped our specialists overcome them.

Delivery pressure in live projects, and disruption due to automation

Often the project teams are busy delivering live projects, and they don’t have the time and resources to carry out automation tasks. Even if they find time, automation can be disruptive to the ongoing work if not introduced at the right time!

Constrained by legacy systems and technical debt

The products being developed by the team may have legacy components which may pose challenges to introducing automation. If the team has accrued technical debt from the past design choices, there is a lot of rework to cope with. The team is already under tremendous pressure of fixing issues and delivering on time, and automation may be an additional risk in the short term which the team may not be ready to take on.

Heavyweight processes

If the current processes are cumbersome and tedious, then they need to be optimised before any sensible automation can be done. Otherwise, the automated solution will also be cumbersome and ineffective.

Expertise and ease of learning

The team has to learn, apply and adapt to the new way of working, and continue delivering on time with the right quality despite any teething troubles. If the learning curve is steep and automation introduces many newer methodologies, then it may be counterproductive.

Buy-in and acceptance for automation

Getting acceptance of the team and all stakeholders is a must for successful deployment of automation. Automation increases productivity and reduces manual aspects of the job. It is imperative to highlight to the team and other stakeholders how it is beneficial for all. For example, a tester who used to write a test report manually could focus on core technical aspects of her job, whilst an automated report is being generated.

Overcoming the Challenges

Challenge	Best practices for overcoming the challenge
Delivery Pressure, Disruption in LIVE projects	<ul style="list-style-type: none"> • Build automation solution in parallel – additional cost is an investment to be highlighted as guaranteed ROI in the future • Choose the right time to introduce automation in the project • Evaluate potential disruptions and mitigate the project risk
Legacy system, Technical Debt constraints	<ul style="list-style-type: none"> • Look for compatible solutions or enhance legacy systems with wrap around add-ons to enable automation • Showcase to management how automation will help pay back the technical debt through the ROI and eventually get the team out of the vicious cycle of technical debt!
Heavyweight processes	<ul style="list-style-type: none"> • Fine tune and optimise processes before automation • Value stream mapping of processes can help identify waste
Expertise and ease of learning	<ul style="list-style-type: none"> • Have the right people for the right kind of automation tasks • Introduce bit by bit for specific tasks and show improvements realised
Buy-in and acceptance for automation	<ul style="list-style-type: none"> • Address personnel concerns and give them confidence • Highlight the benefits for different stakeholders in the business

Benefits from Automation

Apart from the ROI from automation and enhanced productivity for the teams, there are other benefits for key stakeholders in the organisation, as listed below:

- **Time to Market:** Automation saves time, so the product can be launched to the market more quickly. This benefits the business in general and makes the product managers, the business leaders and marketing teams smile!
- **Enhanced test coverage:** Automation ensures the required level of test coverage, and this makes a lot of stakeholders happy. Good test coverage for safety critical components is an advantage for smooth safety approvals of the product.
- **Robust product quality:** With every run of the automated tests, product quality is enhanced. Automation can ensure complete regression testing of every change, making the Quality department stakeholders happy.
- **Productive and Motivated Team:** Automation results in less firefighting and reduces stress for the team as they have more time than before, which keeps the team happy and motivated.

Getting Maximum ROI through Modular, Extendable Automation Framework

Having considered our place on the automation journey and navigated the challenges we can expect along the way, the questions becomes what to automate, what not to automate and how to go about achieving the maximum ROI.

What to Automate	What Not to Automate!
Repeated tasks and tests: Automating these will mean that they will get executed a greater number of times, hence adding to the ROI.	Usability tests that need a human to evaluate the usability aspects. Computers are getting there with Artificial Intelligence, but not there yet!
Laborious tasks and tests: Needless to say, these will save a lot of time if automated. Negative test scenarios: Automating these will ensure consistency and accuracy of the testing performed every time.	User experience tests (same as above) Exploratory tests are usually performed by a domain expert, based on the niche expertise gained over the years. Difficult to replicate the same through automation.
Performance / Timing measurement tests: Automated tests ensure accurate measurement of performance related tests, that involve timing, latency, calculating CPU loads, Network usage etc.	Priority Tests need to be executed right away and there is often no time to automate them. It is better to test them manually and automate later if they need to be reused.

Having a Modular and Configurable Automation Framework

All the good engineering principles like architecture, design, modularity, maintainability, etc., are very much applicable to designing a robust, reusable and configurable test automation framework. A modular architecture enables the test scripts to be segregated into "reusable" automated components. These can then be grouped into collections, or suites of tests for different test scenarios and testing scope.

The automated test framework must be configurable for different values or potential states of the system. This makes the framework reusable across different variants of the product. It is imperative to keep the test data and the test scripts segregated for this purpose. If the test data are hard coded into the test scripts, it becomes difficult to reuse the scripts for a different set of values. Hardcoding defeats the purpose of reusability and reduces the ROI.

We hope this article has given you an overview and understanding of how to go about formulating a robust and holistic automation strategy. If you have any queries, or would like to talk to us about your own project, please feel free to get in touch with Gopal Sivaswamy **email:** gopalsivaswamy@aegisengineering.co.uk

INDUSTRY EVENTS

Rolling Stock Networking (RSN) 2021

A Gold Sponsor of RSN 2021, AEGIS exhibited at Derby Arena on 30th September alongside 150 other companies.

Our Technical Seminar “The future of railways, standardisation and legislation in the UK” attracted a lot of interest and we received excellent feedback from those that attended leading to several enquiries requesting further training courses.

Look at our website to find out more about the various training courses on offer

<https://aegisengineering.co.uk/training-courses/>

In addition to the training courses listed, we are also able to offer bespoke courses covering a wide variety of topics. These can be in the form of workshops or classroom-based learning sessions, we can work with you to find the right option for your company and your learning needs.

All the courses are designed and delivered by our technical experts who are able to share their extensive knowledge and experience. The courses can be delivered at your company premises or online via a virtual meeting platform.



The Railway Three Peaks Challenge - AEGIS Peaky Climbers

As mentioned in previous issues, AEGIS entered a team to take part the Porterbrook Three Peaks Challenge by Rail. After numerous cancellations, the event finally took place 9th - 11th September 2021. The team “AEGIS Peaky Climbers”, raised an amazing £3,841.28 for the Railway Children charity. Walking mostly through mist and rain, the team successfully conquered all three peaks in 48 hours and made it back down the final peak with moments to spare! Well done to Pat Watkins, Gareth Brown, Ian Mackinnon and Luke Wood and thank you to everyone who donated to this fantastic cause!



Rail Diversity Challenge

On 15th September, team AEGIS Shield took part in the Big Rail Diversity Challenge. It was great to take part in this event for the second time (and actually do quite well this time!) as the diversity initiative fits squarely with our company core values and our position as founding signatories of the RIA / Women in Rail’s Equality Diversity and Inclusion charter championing equality, diversity and inclusion in the UK railway industry.





Ben Bridges
Principal Engineer

Ben joins the AEGIS Certification team from SNC-Lavalin / Atkins where he specialised in electrical engineering. He has strong working knowledge of rolling stock electrical systems and EMC and has supported many key rolling stock design projects. Ben brings with him skills in compatibility assessment and change management including application of CSM-RA.



Steve Gossling
Principal Engineer

Steve is a Chartered Mechanical Engineer with 30 years of rolling stock experience. Steve's wealth of experience includes rolling stock procurement and 12 years in vehicle refurbishment and modernisation specializing in brakes, pneumatics and project engineering.



Nan Wang
Project Engineer

Nan joins AEGIS having completed her MSc in Railway Systems Engineering and Integration at the University of Birmingham in which she specialised in systems integration and the complex interaction between railway subsystems, including the human/operations side as well as technical systems. She is currently working with our colleagues at Ikos Lab on development of a model-based systems engineering platform.



Amna Altaf
Cyber Security Engineer

Amna is nearing completion of a PhD in Cyber Security and Human Factor Engineering and recently worked as a Postgraduate Researcher within the Cyber Security Research Unit (BUCSR) & Computer Human Interaction Research Group (BUCHI) at Bournemouth University. She joins our Software and Cyber Security team and will provide cyber security management using safety assessment and a human factors approach.



Georgina Crawford
Core Services Apprentice

Georgina's role involves providing office administration support such as reporting on KPIs, completion of supplier questionnaires, internal communications, internal auditing, AEGIS quality portals, updating the competency database and assisting with the management of approved suppliers.



Lucy Mellor
Office Administrator Apprentice

Lucy has joined the team to support our Office Manager in looking after the administrative tasks of our operations, especially around the management of the offices and in providing logistical support to the company – a task that is becoming increasingly important as we emerge back into the real world after so many months of lockdown.



Mario Ramos Garcia Senior Engineer

Mario is a Mechanical Engineer with a MSc in Mechatronics Engineering. Mario worked for 2 years as Deputy Chief Engineer for the SWR project at Alstom (formerly Bombardier). Additionally, he is an award-winning engineer with international experience in various sectors such as automotive, aerospace, 3D printing and bicycles.



Ben Morley Senior Engineer

Ben is a IMechE Chartered Engineer with a MSc in Mechanical Engineering from the University of Nottingham. He has over 5 years' experience in the rail industry most recently in the Engineering Department at Dubai Metro. He has also worked as consultant for Ricardo Rail working on rolling stock modification projects as a structural engineer.



Fabiano Sgarbi Software Assessor

Fabiano graduated from Politecnico of Turin with a master's degree in Aerospace Engineering. Over the last 3 years has worked at Teoresi Group as Validation Team Manager / Project Manager on several international railway projects involving Vehicle Validation, TCMS Validation and Signalling Validation for several on-board signalling systems. Fabiano has knowledge of the main railway EN5012x standards at system and software levels. He joins us to strengthen our Software Assessment Team in providing essential independent review services.



Katy Grace Recruitment Manager

Katy has come on board at AEGIS as our Recruitment Manager. Recruitment has always been one of the central pillars of our success at AEGIS and we're delighted that, having worked with Katy on a consultancy basis for many years, she has now joined on a staff basis. Katy has many years of experience in B2B PR as well as recruitment, having worked with many blue-chip companies in the East Midlands as well as London.

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