

No warning needed for this Cyclone!

Alastair Roberts, Head of Certification (Plant), AEGIS Certification Services, and Paul Hargreaves, Technical Director, Allan J. Hargreaves Plant Engineers (AJH), describe the work involved in building and certifying the Rail Cyclone 2 bespoke road/rail jetting and vacuum unit.

Genesis

The journey between AJH and road/rail jetting and vacuum units started early in 2017 when Complete Drain Clearance commissioned AJH to convert a crop sprayer type machine to rail. The machine was also fitted with jetting and vacuum equipment supplied by GK&N Services. It was fully certified by AEGIS in April 2018.

Following the success of this machine and a healthy work bank for Complete Drain Clearance, AJH was commissioned to build the next generation vehicle. For several reasons, reflecting on the previous machine, the decision was made that the next example would not be an identical 'sister'. The advantage of it being a 'sister' is that a subsequent machine would be a 'second of class', significantly reducing the manufacturing costs and the scrutiny required for certification.

With the strong relationship between AJH and AEGIS, the latter was the obvious choice to undertake the required independent review of the new machine. With its specialist knowledge in this type of work, AJH is always reassured by the diligent approach AEGIS takes to the scrutiny of its products.

In the rail industry, AJH, along with most of its competitors, are generally referred to as 'converters'. This reflects the situation that, when building new machines, they usually convert a base machine, built by a main manufacturer of plant (OEM), such as Case, Liebherr, Komatsu, Hitachi, Mercedes, Manitou, etc. The most common conversions are excavators, so they can be utilised on the rail infrastructure. The converted machine is then commonly referred to as a 'road/railer'.

Choosing the right machine to convert is always the key to a successful product. However, there will always be compromises



made in this process as the OEM machine is rarely designed for rail use in mind.

During the early stages of the design process for the new machine, it became clear that, for the optimal end product, it needed to be designed and built from scratch to avoid compromise. This enabled the design process to really focus on areas such as ergonomics, accessibility, gauge, maneuverability and the required engine power to perform as per the clients' unique and demanding specification. The resulting machine, referred to as the 'Rail Cyclone 2', was born and became what we refer to as a 'Rail-Roader', with rail being the machine's primary use whilst maintaining the ability to on and off-track, perform off-track duties and be loaded on to a lorry for road transport to the next job.

The benefits

Building the machine from the ground up, provided the opportunity to optimise major features of the machine including:

- Improved access to the machine controls. This has been achieved due to being able to specify the main chassis position and therefore

the location of all major components. As a result, the working height for the machine controls were lowered as well as the location of hydraulic valves and the controls used during maintenance and recovery. Access from ground level, even when on rail, is possible.

- Integration of all the machine's control systems and cameras into a single 12-inch touchscreen display. Many rail conversions end up with an array of separate controls and display systems. This can be quite confusing to operators changing from machine to machine. This presented an opportunity to simplify the machine controls and keep them in one place, significantly improving the ergonomics of the machine. The user interactive touchscreen combined with simplified menu allows the operator to quickly enter the required mode and operate the machine.

- Road and rail brake testing are fully integrated into the display with a routine of on-screen prompts displayed to the operator, allowing the safe testing of the machine's braking systems for road and rail, both park and service. This feature negates the requirement for annual dynamic brake tests.

- The screen also has the display from the machine's cameras integrated, allowing reversing movements at 10mph, switching to bogie deployment cameras when on and off-tracking.

- The system's on-board diagnostics and input/output monitoring also allow users to quickly identify any issues.

Machine specification

Following engagement with the client, a comprehensive set of machine requirements were generated including:

- A stage V, 340hp diesel engine was chosen as the primary power source complying with the very latest emission regulations.

- Hydrostatic drive on road with a two-speed gearbox.

- Road axles complete with differential lock and optimised wheelbase offering two-wheel, four-wheel and crab steering to allow on and off-tracking at the tightest rail access points.

- Hydrostatic four-wheel drive on rail,



- providing effective tractive effort in the most arduous conditions.
- A large agricultural crop sprayer type of operator cabin with superior all-round visibility, combined with 360° reversing and on/off-tracking cameras.
- An auto-refuelling system, reducing the need for manual handling of fuel containers when refuelling is required away from main storage facilities.
- Centralised greasing system, meaning less day-to-day maintenance requirements whilst enhancing machine reliability and reducing operating costs.
- Compliance with the minimum

- dimensional requirements in travelling mode of both W6a and plant gauge, as well as clearance to allow travel under live overheads.
- 125LPM @ 2000PSI jetting capability for clearing of drainage systems.
- 130m³ @ 500mbar vacuum capacity for the removal of dirty water and debris from site.
- 8,000kg carrying capacity split between fresh water and debris tanks.
- Boom and jetting reel located over the front of the machine with wireless remote control of all boom and tank functions, providing optimal vision of the work activity to the machine operator.
- 37KW 3-cylinder turbo-charged diesel engine as a secondary power source allowing use of all machine functions in road and rail mode during emergency recovery situations, enabling the machine to recover itself off rail in the event of main engine failure or main electrical system failure.

assessment associated with the machine, ensuring that all risks have been mitigated in an appropriate manner using the 'hierarchy of risk controls' (see *Rail Infrastructure* Issue No: 135).
 Following the above activities, AEGIS was able to complete the certification activity of the machine issuing a First of Class Engineering Conformance Certificate and undertaking the Product Acceptance review. Following receipt of the Product Acceptance certificate, as issued by Network Rail as the infrastructure manager, the Rail Cyclone 2 is now fully compliant with the requirements to enable it to work on Network Rail-managed infrastructure.

Certification

Throughout the project, AEGIS undertook several phases of scrutiny. These were split into three main aspects:

- Design scrutiny - a review of the design aspects of the machine to ensure that the resultant machine would meet the necessary technical standards.
- Build scrutiny - consisting primarily of witnessing tests of the machine upon completion of the build to validate the design through demonstration as applicable.
- Performance validation - assessing the performance aspects of the machine to validate it against the manufacturer's claims.
- Safety evaluation - reviewing the risk

