

Depot control for the 21st century

The UK's rail industry has faced a number of challenges over the last year, with increasingly negative reports of punctuality and delays surfacing in the media every month. The Office of Rail and Road's passenger experience report shows that, despite significant historic improvements being made to operations in UK, including punctuality, the industry suffers from a persistently poor perception of its services.

It is therefore vital that efficiencies are located wherever possible, including in areas that are invisible to passengers, as the knock-on effects of operational delays caused by inefficiencies in depot operations can be almost impossible to mitigate.

In any depot, yard or maintenance facility, it is essential that trains depart on schedule. With so many activities taking place before service, including cleaning, CET (controlled emission toilet) service and small repairs, a quick and reliable signalling system that is easy to handle is a must for successfully managing operations.

Managing movements

The Tie-Fen Lock Depot Control system - consisting of the TMC-RaStw depot system - is an innovative solution that assists depot operators by reducing their workload and increasing safety, allowing them to set multiple routes within the depot in just a few seconds to optimise the operation of the depot.

Fenix Rail Systems, in conjunction with its partner Pintsch Tiefenbach, is the sole provider of the Tie-Fen Lock Depot Control system in the UK. The companies' combined knowledge and experience, with hundreds of depot systems in use worldwide, has enabled designers to develop a system that makes depot operators' jobs quicker and easier - meaning that a single operator is able to control even complex depots. This is already the case at the Deutsche Bahn (DB) depot in Cologne, Germany, where 105 point machines, 97 signals and 100 axle counter track sections are controlled by just one depot operator supervisor (DOS).

It is imperative that train movements into, out of and within a depot are as smooth as possible, and the Tie-Fen Lock system allows single operators to control as many movements as possible, safely and easily.

The system is totally adaptable and equally applicable to modified and new depots around the UK rail network due to its centralised depot control features, flexibility and low operating costs.

Fenix has developed a bespoke technical interface that enables the system to be integrated with all UK-based interlockings. Indeed, it has already been implemented in several UK depots, including:

- » Central Rivers, Burton-on-Trent - 26 points, signals and axle counters;
- » Northam Depot - 10 points, signals and axle counters;
- » Immingham Port - 10 points, signals and axle counters;
- » Golders Green Depot - 29 points, signals and axle counters;
- » Morden Depot - 32 points, signals and axle counters; and
- » Banbury Depot - 7 points, signals, axle counters and interfaces to mainline interlocking and DPPS.

Depot operators have many responsibilities in addition to setting routes, including entering train describer codes and communicating with drivers, maintainers, interface signal boxes, operations staff and contractors working





Point control

All points control circuits communicate with the central control unit via serial bus. Each points control circuit has its own microcontroller card for communication and individual functions. For fast responses, the points controllers are typically organised into sub control logic groups of 60-80 points. These substations exchange information and data with the main logic station via serial interface. Over long distances, fibre-optic communication is recommended, allowing up to 256 points controllers to communicate with just one CPU.

Should the project require stage work, individual points control circuits can be enabled according to the stage requirements. This provides total flexibility during the installation of any stage or enabling works.

This approach allows the hardware design to be completed and stage work data design prepared and downloaded to new cards in advance for a simple card changeover during commissioning.

The Tie-Fen Lock approach to sub-grouping circuits saves time and costs on projects by reducing cabling costs over long distances, as well as overcoming specific cable route problems on existing infrastructure.

The point machine is fully trailable and can be six-foot or four-foot mounted, depending on the requirements of the client.

on site, as well as being responsible for the overall operational safety of the train facility. Codes of practice and safety dictate that all of these actions must also be recorded via daily reports and entry into the train register.

As the operators go about their daily tasks, the Tie-Fen Lock Depot Control system's computer-based interlocking (CBI) continuously and automatically checks the current traffic and operations in the depot, alerting the operator to any conflicts or potential dangerous situations and preventing a wrong-side failure.

The system also checks that the operator's commands are safe and do not conflict with the implemented rules and operations, alerting them using pop-up information boxes and audible or visual alarms where necessary.

Activities are automatically recorded throughout each shift, with a printed copy available at any time to assist daily reporting.

In the event of an emergency or degraded mode situation, the system has a defined (configurable) fallback level to minimise any impact on train movements, getting the system and movements back up and running as soon as possible.

During peak times, the handling of incoming and outgoing trains can require complex shunting movements. The Tie-Fen Lock is designed to make this as stress-free as possible, with a screen layout that allows for a good overview of the depot situation at all times.

All operational and hardware commands and activities are continually monitored, logged and saved in the data log file on the VDU PC. This data has a number of practical uses, including helping maintainers to prepare themselves with spare parts before going to the depot, allowing engineers to review the status of the ongoing system and its activities as well as enabling managers to plan predictive maintenance and to continuously improve and fine tune their strategies.





Signals

Six individual signal controllers can be housed in one 19" rack. Each signal controller card is the interface between the central control unit and local shunt signal (normally a Dorman LED head for the UK infrastructure). An internal fallback function guarantees the reversion of a signal to danger (red) in failure mode, for example in the event of loss of communication or loss of control voltage.

This modular design results in a system that is able to control hundreds of signals that can be modified or upgraded at any time with minimal software and hardware changes - users simply plug in a new signal control card. This also provides a significant time and cost saving when implementing a system in stages, as not only is the hardware a modular design, but the software is too.

Train detection

The Tie-Fen Lock system receives vital track occupation information from track section control circuits. There is an individual, modular pair of circuit boards for each track section. These SIL 4 (safety integrity level 4) control circuits are purely hardware-based and a hybrid FPGA (field programmable gate array) relay-based dual channel design.

All track section control circuit 19" racks and their printed circuit boards (PCBs) are built up in a modular form and can be

cascaded in unlimited numbers of racks in an unlimited number of cabinets. This modular design with plug couplers allows the system to be integrated into existing infrastructure in stages and ensures a quick and easy modification to the next stage commissioning.

Track occupation data is transmitted with the output of switching amplifier cards and input information is received via rail-mounted axle counter heads. These detect the flanges of the wheels on the running rail and work as proximity switches, generating an analogue signal that is fed into the switching amplifier in the REB for evaluation and electric noise filtering. This communication works safely and reliably over distances of up to 8km.

Axle counter detection

The axle counter head is a dual-proximity switch unit designed to detect the flange of the wheels passing over the two proximity switches. With each detected wheel, the axle counter detection systems send one package of data to the switching amplifier.

The evaluation electronics used in train detection and axle counter detection are installed in the REB or location case, there is no danger of damage from trackside lightning strikes or over voltages. This is a significant advantage of the Tie-Fen Lock system, as many other systems require electronics to be installed trackside.

An outstanding track record

The Tie-Fen Lock system was first installed in the UK at the Central Rivers Depot in 2000 and has since established a track record of outstanding reliability and low maintenance. The system is simple, offering numerous benefits over old systems, and its low-cost and simple maintenance makes it highly likely that depots across the country will be enjoying these benefits for years to come. ●



Experts in mainline and depot control systems

Who we are

Fenix operates across the UK, Southeast Asia and Australasia to provide high-quality signalling and telecoms services for mainline rail and depot control systems.

We provide a wide range of expertise and services allowing us to deliver collaborative consultancy services and turnkey signalling solutions that add real value to our clients and rail projects worldwide.



Signalling design



Signalling installation



Signalling testing and commissioning



Bespoke depot signalling systems



Independent checking



CRE/CEM services



Signal sighting



Project management



Project engineering



Telecoms

Whatever your signalling requirements, Fenix has it covered.

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