Siemens Rail Systems
Helping the UK stay on the right track to success
Siemens has a proud 170-year history in the UK - today we employ around 13,000 people here, with 54,000 jobs also supported through our activities. And we are equally proud of our continued focus on driving the UK rail industry forwards.

Over 700 highly skilled people work in our UK rail systems business - responsible for high-speed and commuter rail developments along with our train service business, which ensures that 350 clean, comfortable, safe and reliable trains go into service every day with seven train companies, travelling some 50 million miles a year.

Alongside this is our Rail Automation business, whose UK-manufactured train radios are installed in every train in the country. Plans to expand this business have been announced recently through the proposed acquisition of Invensys Rail, which is expected to be completed later this year.

Our award-winning Siemens Desiros are known for their quality and reliability - and also value for money. A recent project has improved services for London Midland passengers by running Desiro trains at a higher speed of 110mph - right in line with the emphasis that the government and the McNulty study have placed on sweating the existing assets, squeezing more value from the same money.

We’re looking to raise the bar again, by driving forward a new generation of Desiro trains, which are much more energy efficient, much lighter in weight, kinder to the track, and can carry more passengers. Switching Britain’s electric train fleets to second-generation standards will make a major contribution to the industry’s drive to optimise return on investment and increase efficiency.

Our design intended for Thameslink evolved from this second-generation Desiro City platform, and we were delighted to reach commercial close on this contract late in 2012. We have already produced a lot of the components for our Desiro City trains and they are running at our dedicated test track. The test track is a real asset in ensuring that our new trains can accumulate fault free mileage to Network Rail standards without disrupting the UK network.

We are also forging ahead with two additional orders - one is a London Midland and First TransPennine Express joint order for 20 new 4-car electric trains, with a programme of changes at Ardwick depot in Manchester to make it a home for electric trains as well as diesels.

And the exciting order for ten ‘e320’ high-speed trains for Eurostar is also making progress, with the first units on test. Again, we are modifying Eurostar’s Temple Mills base in London for the new trains.

Trains such as the e320 or Desiro City mark a big change in technology - and to make sure our service teams have the leading-edge skills to keep the new generation of trains reliable, safe, and welcoming, we plan to create a new training academy. In close collaboration with the National Skills Academy for Railway Engineering (NSARE), we are backing expansion of the academy for the whole UK rail industry to train its rail engineering personnel and help equip our industry with future proof skills.

The UK has an unsurpassed railway heritage and a fantastic future, something we believe is worth sharing. We want to see the UK rail supply industry develop and compete internationally. Our initiatives to develop expertise and awareness include Meet the Buyer events, and Rail Supplier Days where UK companies meet our procurement people. Our Desiro City design, for example, includes UK-supplied equipment from independent companies and our own UK facilities.

To keep our trains at the leading edge of technology, we work in collaboration with our customers on innovations, such a series of improvements on South West Trains’ Desiro fleet. These include track-friendly hydraulic suspension bushes which help reduce track damage, cut infrastructure maintenance costs and provide smoother journeys for passengers. And we use acoustic technology that can detect axle defects or deterioration.

We actively seek customers’ opinions of our business, and work with them to improve. Not resting on our laurels, another major survey is just in progress.

In the year that Siemens celebrates 170 years in the UK, the company is a principal sponsor of London Underground’s celebrations to mark its 150th anniversary. It’s also a time for looking forward - the rail industry has exciting plans for investment, with new trains needed for Crossrail, HS2 and the electrification projects, and developments on existing networks. London Underground also has big plans, including replacement of three deep-tube line fleets with highly innovative new trains. Although these projects are still in the discussion or bid stage, we are keen to help apply the best technology to all of them, and have been working with project teams to suggest and assess innovations to save costs and energy, while providing designs for trains that we believe passengers will love.

We will continue our drive to keep safety, innovation, efficiency and cost saving at the heart of everything we do within the UK’s railway. Steve Scrimshaw
Siemens in the UK

Siemens is a well-established manufacturer and maintainer of UK rolling stock, with 10 fleets of trains currently running in the UK and more on order. Of course for many of us that’s where our knowledge of the company ends.

In reality Siemens celebrates its 170th anniversary in the UK this month. Young William Siemens’ start-up company went on to introduce the first water meter, electric dynamo and electric street lighting in the UK, while the rail business has gone from strength to strength since the launch of the first public electric railway in Ireland in 1883.

Siemens is as proud of its heritage as George Stephenson was of the first public railway line to use steam locomotives. Since that time the company has advanced and developed enormously and today contributes to the UK economy by employing over 13,500 people across all regions of the country and achieving an annual turnover in 2012 of £3.2bn.

Siemens’ workforce is highly skilled, with a significant proportion of technical and engineering roles throughout the UK. The company doesn’t hide its commitment to a high performance people culture, with a talent management programme to identify and develop the skills of employees, and a focus on attracting and retaining the best people in the industry. As a result, in 2012 Siemens employed more than 300 apprentices, all of whom could take advantage of a clear career development path.

According to figures based on independent research from Capital Economics in 2011, Siemens is 67% more productive than the average for the UK manufacturing industry. The same research indicated that Siemens’ supports more than 54,000 jobs through its activities, and stimulates the creation of more than £3 billion gross value added, while the trade deficit in 2011 would have been more than 3% larger without Siemens contribution.

Looking at Fastrack.co.uk’s 2011 ranking, if Siemens were a privately owned company it would be the UK’s eighth largest.

“We are a global company but there’s no doubting our UK credentials,” says Siemens Rail Systems MD Steve Scrimshaw, a Geordie who began his career in the energy sector before moving to the rail industry in 2007. His sentiment is echoed by UK Chief Executive Roland Aurich, a Swedish national who moved from his position of President & CEO of Siemens in Canada to take up the reins in the UK just over a year ago. “We contribute significantly to the UK economy, through our inward investment, UK manufacturing and job creation,” he says.

The company’s UK portfolio and structure mirrors that of the global organisation with a focus on energy, healthcare, industry and manufacturing, as well as the newest sector: infrastructure and cities. This sector, which includes the rail business, comprises integrated mobility solutions, building and security systems, power distribution and smart grid products and solutions, with its latest initiative - a £30million investment in a global centre of competence for cities, called The Crystal, in London. This is the world’s largest exhibition about sustainable urban infrastructure and aiming to be the first building in the world to hold the highest classification of both LEED (Leadership in Energy and Environmental Design) and BREEAM (BRE Environmental Assessment Method) certification for environmentally sustainable buildings.

Did you know?

- The power generation capacity of Siemens’ onshore and offshore wind farms in 2012 represented approximately half of the UK’s total wind power generation capacity.
- Superconducting magnets made at Siemens’ Oxfordshire factory are installed in more than a third of all MRI body scanners which are exported to hospitals worldwide.
- More than 1.3 million high efficiency motor drives, manufactured by Siemens in Congleton, are exported to 78 countries.
- Hybrid technology from Siemens is at the heart of Manchester’s new Shuttlebuses and London’s new Routemaster buses.
- Network Rail’s entire infrastructure is protected by 4,000 Siemens CCTV cameras.
- Siemens is a strategic partner for Source London, aiming to deliver electric vehicle charging infrastructure across cities in the UK.

The Crystal, next to the Royal Victoria Dock in London, is the world’s largest exhibition about sustainable urban infrastructure.
Supply chain development

Siemens is committed to creating and nurturing talent in support of long-term involvement in the UK rail industry - and it also constantly works with its UK supply chain partners to assist them in understanding their product performance, explaining the changing demands of the marketplace, and finding mutually rewarding solutions.

The rolling stock business has almost 650 UK suppliers, over 80 of them also supplying to Siemens rolling stock activities outside the UK.

‘It’s natural for us to have a mutual commitment with UK suppliers,’ says Siemens’ Andrew Lister, ‘because we depend on a responsive supply chain to help us succeed in the 365-days a year business of maintaining trains that run 50 million miles a year.’

‘So wherever possible we deal with local suppliers: being close at hand helps with that all-important responsiveness, and also makes sharing information and ideas a lot easier. Over 80% of our third party purchasing spend is with suppliers in the UK.’

Siemens invites its key suppliers to an annual UK Rail Supplier event which has been held for the last seven years: ‘We share the latest details of the business, present a vision of where we are going, and indicate the support we need from them - whilst also setting out to build relationships,’ says Andrew Lister. ‘We believe we build good trains, but to get the best out of our trains, we need suppliers to support us in our service obligations. At these events our best suppliers achieve formal recognition in front of their peers.’

‘In creating long term collaborative supply relationships, we believe we can help suppliers to be the best they can be,’ adds Siemens’ Steve White: ‘We aim for a balanced partnership, taking a long term view of the best way to keep trains safe, reliable, and affordable. Our aim is to be the customer of choice for our suppliers. We treat them with respect, pool our technical knowledge and find the best solution for the rolling stock leasing companies and train operating companies.’

This approach will be formalised in the future through the adoption of the BS11000 collaborative-working standard for key relationships.

To extend the reach of UK suppliers, Siemens has used a Meet the Buyer concept - an event that can help suppliers grasp new opportunities, through discussions with Siemens procurement people, from the manufacturing as well as maintenance organisations, or with some of Siemens first tier suppliers, many of whom already have an international presence.

A very successful event, jointly sponsored by the Department for Business, Innovation & Skills (BIS) and UK Trade & Investment (UKTI), was held last summer and supported by Siemens.

Sustainable skills for the future

Siemens is driving forward with exciting plans for a new training academy for traction and rolling stock, after a detailed study of the future training needs for its expanding team.

As train technology advances and the workforce increases, with new Siemens train fleets entering service, Siemens expects its training requirement to increase by 50% to around 4,500 person days per year.

With the railway industry facing a critical shortage of qualified people, Siemens also aims to play a leading role in the new railway skills development programmes being driven by the National Skills Academy for Railway Engineering (NSARE).

To achieve this goal, Siemens is backing expansion of the facility for the whole UK rail industry to train its rolling stock and traction-focused personnel. ‘This is essential for the long-term development of the UK rail industry and we are excited to be working with NSARE. Our joint goal is to set up a National Academy for Rolling Stock Engineering which will be accessible to all,’ confirms Siemens Rail Systems Managing Director Steve Scurmshaw.

New Siemens rolling stock such as the Desiro City and the ‘e320’ Velaro for Eurostar are examples of the ever-increasing levels of sophistication to be found in modern trains - ‘engineers maintaining these trains will use their laptop more often than a traditional toolbox’, says Graeme Clark of Siemens.

To make sure its service teams are fully equipped to ensure the new generation of trains perform to the highest standards, Siemens concluded that the best approach was to build a new state of art training academy for personnel from all its traincare locations. The location chosen was Northampton, adjacent to its Kings Heath traincare facility which also houses the UK Rolling Stock Service Headquarters.

‘Siemens wants to lead the industry in these developments, and make sure the very best people want to come and work for us. We want all our people to benefit from the highest possible quality of training, and keep up to date with the rapid developments in train technology,’ says Graeme Clark.

The new academy will have both ‘clean’ and ‘dirty’ classrooms, containing various items of train equipment in place for students to work on. A Virtual Reality facility will give access to full-scale 3D models of trains. These 3D models will be used for training purposes, engineering support and customer demonstrations.

A dedicated track at the adjacent traincare facility will be home to the first trains from new fleets, so that engineers can benefit from further hands-on experience in a safe and effective learning environment.

Siemens is immensely proud of the technical calibre and attitude of its existing team and is looking to reinforce this in the future with this investment. 50% of the capacity created will be offered to other industry stakeholders (customers, other train manufacturers and suppliers) to ensure rolling stock success is industry wide.
Heathrow Express - Class 332 transformed

The Class 332 fleet was built in 1997-1998. The 14-strong fleet comprises nine 4-car and five 5-car sets which are maintained by Siemens in a dedicated facility at Old Oak Common. Since entering service in 1998 the Heathrow Express trains have carried over 60 million people and with their 15th anniversary approaching it was clear that, in order to maintain the right customer environment for this premium service, a full overhaul and refresh was required.

Following an evaluation of its business, Heathrow Express decided that the opportunity should be taken to position itself as a ‘high-end’ brand and that a major re-design of the trains, inside and out would take place. The company worked with Siemens, consultants Interfleet and a design house to create a new brand identity and a completely new interior that would include, for the first time recently in the UK, 1+1 seating in First Class. A mock-up was created in a vehicle taken from the fleet so that the designs could be fine-tuned before the full project started. As Steve White, Service Director from Siemens, points out: ‘This was a market-driven approach which reflects the fact that many passengers have paid significant sums for their flights and expect their train journey on to London to offer a similar ambience.’ The double-digit-million-pound investment that Heathrow Express has made ensures passengers now have an outstanding experience, affirmed by one traveller who commented: ‘It’s not like any train I’ve been on, ever.’

As well as the changes to the seating layout, the First Class seats have been covered with the new E-Leather material which gives a very high quality and durable finish. Seats in Express Class feature power sockets for mobile phones and laptops, as well as trinket tables with cup holders, whilst First Class tables have two power sockets, including USB charging points for mobile devices, reading light switches and cup holders. The trains feature new mood lighting which changes throughout the journey, and real-time airline departure screens in every vehicle not only show flight times but the appropriate terminals for each flight and details of any delays. A 3G cellular service is available throughout the journey, including within tunnels and stations, and energy efficient lighting has replaced thousands of halogen lights originally fitted to the units. The refurbishment itself is being carried out by Railcare at its Wolverton facility, with all vehicles stripped out completely before new or refurbished parts are fitted into the empty shells.

The vehicles are being reglazed, and the opportunity has been taken to carry out some other component renewals such as the replacement of the traction cables whilst access is so much easier. Each 4-car set has seen the replacement of 1,600 wiring looms, and over 1,300 new components sourced from over 200 suppliers have been fitted. The project took nine months from final drawing to delivery of the first set, and with eight of 14 trains completed by the end of January 2013, the entire fleet of 47 Express Class and 14 First Class vehicles was due to be completed by the spring of 2013, with each set taking approximately six weeks to complete. As a result of the project Siemens is determined to ensure that every passenger will get an equally high quality and repeatable experience and has re-written the cleaning standards and maintenance regime to preserve the ‘as new’ feel, post refurbishment.

Steve Smith, Fleet Manager at Siemens, said: ‘Heathrow Express had the vision and we worked with them, their designers, Railcare and Interfleet to deliver this vision on the trains. You can’t tell these are 15 year old units as this investment has completely transformed the fleet.’

The project is summed up by Dan Smith, Head of Engineering at Heathrow Express: ‘We set the bar high for Siemens to deliver a product that would represent our brand by giving our customers the experience and comfort they deserve. What has been delivered has surpassed our expectations.’

The major re-design includes 1+1 seating in First Class.

Transformed - a Class 332 train at London Paddington.

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- The Class 332 trains carry 16,000 passengers per day.
- They undertake 150 journeys between Paddington and LHR daily.
- The 15 minute journey operates every 15 minutes.
Opened in 2006, Siemens’ £30 million Ardwick train maintenance facility, south east of Manchester Piccadilly, is home to the 51-strong fleet of Class 185 Desiro DMUs working for First TransPennine Express (FTPE).

With a two-road fuelling point and depot building capable of holding two Class 185s (each of three 23-metre vehicles) in each of its four roads, Ardwick was expected to remain a diesel-only facility for its operational life. However, with the North West Triangle electrification scheme, FTPE will be able to use electric trains on its Manchester-Scotland services from December 2013, and an order for ten Class 350/4 Desiro EMUs was placed with Siemens. It was also confirmed that Ardwick would be the home depot for the fleet. As Siemens Fleet Manager Pete Redding explains: ‘This meant not only the electrification of the depot, but other changes to the infrastructure at Ardwick which would allow far more flexibility in train movements around the site.’

Work on site, which began in September 2012, is being carried out by Spencer Rail on behalf of Siemens, with the aim of completion by 31 July 2013, well ahead of the 1 September date when the depot needs to be fully operational for test running. Initially this will involve a Class 350/2 set ‘borrowed’ from London Midland. Costed at £5m, the project goes beyond the minimum scope required by the Department for Transport, thanks to additional investment by Siemens to provide future-proofing and improve the operation of the depot.

Says Redding: ‘We’ve given the contractors flexibility to plan the inside and external work so that progress isn’t delayed by any severe weather. This emphasises the partnership between FTPE, Siemens and Spencers which has enabled the project to be delivered in such a tight timescale.’

The depot building is being extended at the western end by 10 metres, which will enable 4-car (20m vehicle) EMUs to be accommodated. Whilst only a single road is to be electrified, it seemed sensible to extend all four roads, including their access pits and overhead cranes, once excavation was underway, to minimise any further disruption should the depot be used...
for more electric units in the future. Four new jacks are being installed on one of the non-electrified roads, whilst Road 8 has been selected for electrification as it has roof level access.

As well as the installation of the overhead line (OHL) equipment and associated safety interlockings, the exhaust extraction ducts for the Class 185 units are being removed, meaning that this will become an electric-only road. The interlockings also protect the high level access to adjacent roads. A multi-stage key system will ensure that the roof-level platforms cannot be accessed unless the road is fully isolated, following best practice across the industry. The process for the removal of HVAC equipment from the DMU and EMU sets will change as a part of the electrification programme.

Outside the maintenance shed, all four roads will be electrified up to the front of the building, whilst the roller door leading to Road 8 will be replaced by a bi-fold type to allow the overhead wires to run into the depot. The length of a 4-Car Class 350/4 means that unless further work is carried out on the depot building and track layout only one set will be able to access Road 8 at a time. Within the depot, all roads, apart from those inside the shed, will be electrified, requiring the cutting back of the apron over the two fuelling roads to give clearance for the OHL, and also modifications to the train wash - the wash's roof-level brushes (which have never actually been used) will be removed and the bodyside spraying equipment will be changed so that jets are directed downwards and away from the OHL.

The electrification work itself requires the piling and installation of support structures throughout the depot and also extensions to three Network Rail structures outside the depot boundary. To increase efficiency, the connection of the OHL to the existing NR wires on the main line will be done during two possessions already planned for other work in the area. The power to the depot will be fed either as a spur from the NR supply, or directly from the Ardwick Track Section Cabin (TSC) so that isolations of the main line will not affect operations on the depot itself.

Sidings and the depot can be isolated individually if required. The installation of the 25kV wiring meets all Network Rail standards and includes the specific regulations for the area around the diesel fuelling roads where the presence of live cables near highly combustible fuel needs to be treated carefully. Access to the building and the depot tracks for the electrification work is available between the morning and evening peaks, and, despite the extent of the work being carried out, there has been no loss of capacity at Ardwick through the 10 month project. Once the ten Class 350/4 sets are based at the Manchester facility, six will visit the depot each night, with the other four being shared evenly by Corkerhill and Craigentinny depots in Scotland where attention will be restricted to CET (controlled emission toilets) and cleaning work as required for the sets to enter service the following day.

At Ardwick, changes to software will allow the simultaneous movement of several sets on the depot, improving productivity and flexibility, whilst a change to access into the depot from the Manchester Piccadilly, western, end through the carriage washer has also been required due to the additional length of the 8-car Class 350/4 formations. The practice for the arrival of Class 185 sets was for the driver to draw up to a telephone and request the washer to be switched on, but this system would see the 8-car sets fouling the main line which would not be acceptable. A new ground signal will now permit sets to run straight into the washer which will be automatically triggered by a treadle switch and an infra-red detector which will also identify the class of train arriving.

On completion of the project, 20 additional jobs will be created as the depot moves to handle 17 Class 185s and the 6 Class 350s each night. All of the technicians will be able to work on either class of unit, with training being carried out at Siemens’ Northampton depot and also in Germany.

Reflecting on the delivery of the project, Chris Nutton FTPE Programme Director, comments 'When the project was first discussed, we were expecting to be asked to draw up plans to decrease the workload at Ardwick whilst work was underway. We are pleased and very impressed with the way the project has been managed, and the fact that the depot has been able to remain fully operational throughout. We look forward to its successful completion, and the start of testing prior to the arrival of our new fleet of trains.'

The depot building is being extended at the western end by 10 metres, Tony Miles.
It seemed a simple announcement - London Midland was seeking to increase the running speed of its Class 350/1 EMU fleet from 100mph to 110mph, in order to reduce journey times and allow an additional hourly service to operate out of Euston on the WCML. Wouldn’t this just be a case of allowing the drivers to continue accelerating to a higher speed, easily within the fleet’s capability, following approval from the relevant bodies and the manufacturer, Siemens?

Obviously the reality is somewhat different, and a lengthy process of testing and evaluation was required before running at the higher speed was approved. The Class 350/1 and 350/2 fleets are amongst the most reliable AC trainsets in the UK - an achievement of which the Siemens maintenance team are rightly proud - and, as Siemens Fleet Manager, Mick Hill, took time to emphasise, any changes to their operation had to ensure that this reliability was not affected.

After a thorough assessment of London Midland’s needs, it was decided that the 30-strong, dual-voltage, Class 350/1 units, constructed in 2004-05 and originally used on the Milton Keynes to Croydon route, would be modified for the higher speed. The newly-ordered Class 350/3 and 350/4 units being constructed for London Midland and First Transpennine Express will also be capable of the higher speed.

Steve White, Siemens UK Service Director, explains, ‘LM 110 is an absolutely fantastic concept, an order of magnitude cheaper than a route upgrade. But whilst the idea seems simple, the reality is far more complex, as everything on the train is designed around a continuously rated 100mph. In effect the proposal required us to go right back to square one and re-validate all of the engineering designs and the approvals process – all within a strict timescale to meet the start of London Midland’s new winter timetable. This was followed by extensive modelling before on-track testing began in the UK.’

In total the Siemens team identified some 120 potential technical issues, and had to work through each of these to ensure each existing system or component could safely be used at the higher speed or source new ones. An early discovery was that the slip ring on the armature could not cope with the extra centrifugal force at the higher revolutions, meaning it would ultimately fall apart if it ran for any length of time at the higher speed, particularly on sets with worn wheels. So these needed replacing, along with the lateral dampers on the bogies, whilst changes were also needed to the aerodynamic properties of the pantographs. In-cab equipment was changed and new software was written which not only allowed the sets to run up to the higher speed, but for safety reasons also ensured that coupling to a Class 350/2 unit, or initially another Class 350/1 set, automatically restricted the formation to 100mph running.

**Project 110 on London Midland**

Benefits for London Midland customers

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<th>Key reductions in journey times:</th>
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<tr>
<td>Crew - up to 30 min</td>
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<td>Stoke-on-Trent - up to 35 min</td>
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<td>Lichfield - up to 33 min</td>
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<td>Stafford - up to 35 min</td>
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<td>Nuneaton - up to 34 min</td>
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<td>Rugby - up to 35 min</td>
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<tr>
<td>Milton Keynes benefits from an hourly non-stop service to London which takes just 35 minutes.</td>
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collaboration between London Midland, Siemens (in the UK, Austria and Germany), Network Rail and several sub-suppliers - a process that was managed by Mick Hill and his team based at Northampton. The process was also made possible through the use of eight spare bogies, produced when the sets were originally manufactured, and indicative of Siemens’ forward-looking approach, which saved a good deal of time and cost - otherwise a set would have had to be built before the modification programme could start.

With the first stage of the project completed and sets now running at 110mph, attention has turned to obtaining clearance for 8 and 12-car sets to run at the higher speed and to assess any increased brake disc wear and power consumption as part of a ‘value for money’ exercise. Mick Hill explains, ‘Energy consumption is relatively simple to assess because of the on-train monitoring equipment fitted to the fleet. However we needed to look at whether the additional speed would impact bogie fatigue life, so in February we started additional tests involving the use of a fully instrumented train to prove our modelling calculations are correct.’

The project is seen as extremely successful by all parties involved, as Steve White reflects, ‘Potentially there could have been a number of barriers to stop this project working, but teamwork ensured project success. We carried out a number of 12-car tests without needing to cancel any trains or seeing any service trains short-formed. The testing and changes were approved by all the safety bodies and London Midland deserve a lot of credit for the idea. Taking EMUs up to 110mph is really a “no-brainer”, albeit not without its challenges. It’s a very cost effective solution for the marketplace and provides tangible benefits for passengers.’

London Midland’s Head of Programme Management with overall responsibility for the 110mph Project (Project 110), Graham Boden, said, ‘The development of the innovative Project 110 has been an outstanding example of industry collaboration. The London Midland team came up with the idea of running services faster by adapting our Class 350/1 fleet, which would also enable us to add additional route paths. The scheme has been a hugely complex one, but through the close working relationships we have with the likes of Siemens, Network Rail, Angel Trains, Interfleet and other partners we have been able to deliver the project on time. I believe this has set a precedent for the rail industry in terms of collaboration and innovation and we are delighted that London Midland has taken a lead on this.

Thanks to Project 110, customers not only benefit from faster journeys on the Trent Valley route to London Euston, but we have also been able to add in a new hourly non-stop faster service from Milton Keynes to Euston. Our continued investment in rolling stock will see the introduction of ten new “350/3” trains next year.’
Maximising the potential of existing train fleets is a priority for Siemens, as it aims to spearhead the rail industry’s drive to achieve long-term value from its investments. Siemens sees real benefit in working in collaboration with its customers to help them drive down costs, drive up efficiency and keep trains at the leading edge of technology.

A shining example is Siemens’ long-standing relationship with South West Trains - now working in an Alliance with Network Rail, which can quickly spot the benefits of train innovations - for passengers, and the train and track operators and maintainers.

In the latest innovation, South West Trains’ Class 444 Desiro trains are being fitted with Wi-Fi technology, allowing passengers to access websites and email on the move - and also enabling live monitoring of the Desiro trains and rail network by South West Trains and Network Rail.

New driver’s-eye-view cameras to make this monitoring possible are also being installed on the Class 444 Desiro fleet, and the new Wi-Fi will beam pictures and data back to base, to give controllers a real-time view of developments.

The innovations highlight the Class 444 as a showcase of how to bring an existing train right up to date with the latest technology - adding to a comprehensive package of efficiency-driving engineering technologies already embraced by South West Trains. These include: hydraulic bushes to reduce track wear, pro-active monitoring of wheel bearings, energy-saving regenerative braking, and winter-weather coupler heating.

Yet more initiatives are planned, including Automatic Selective Door Opening (ASDO) to help the introduction of longer trains and combat the issues caused with short platforms - as well as monitoring by on-train equipment of both the track and the third, electric rail, to ensure they meet the correct specifications.

Embracing these innovations means that passengers and the train company benefit from greener, more energy efficient travel, reduced long term operating and track costs, and reduced disruption caused by train and track wear and cold weather conditions.

**Hydraulic bushes reduce track wear**

Siemens has introduced innovative hydraulic bushes to the South West Trains Desiro fleet. This enables existing trains to maintain passenger comfort whilst reducing track damage and so drive down track maintenance costs. The bushes combine conventional elastomer bushes with a hydraulic system, reducing the force between the wheel and the rail, ensuring better movement on curved track at low speeds.

In a project initially funded by Network Rail, the variable stiffness radial arm bushes were developed by Freudenberg Schwab Vibration Control from information supplied by Siemens. They incorporate two reservoirs of fluid joined by a convoluted...
path: at low speeds, the fluid can move between the reservoirs relatively freely, reducing the stiffness and thus the forces at the wheel-rail interface that damage the track. At higher speeds, the fluid flow is reduced so the bushes provide a higher rotational stiffness to the bogies and thus a smoother ride for the passengers.

The bushes were first installed on all Class 444 Desiros with attention then turning to the Class 450 Desiro fleet.

**Regenerative braking**

In conventional train braking, the energy produced by the brakes is lost as heat through the brake pads or an electric braking resistor. Regenerative braking systems capture this energy and return it to the network as usable electricity, and can lead to substantial environmental benefits through reduced net energy usage – as well as the resulting cost savings.

South West Trains estimates its overall fleet energy saving from regenerative braking at 15%, with equivalent savings in CO2 emissions.

The system returns electricity generated in braking to the electric rail, allowing other trains to draw on this electrical supply. In non-regenerative electrical braking systems, the motor is used to absorb mechanical energy and convert it to electrical energy, and a large resistor is used to dissipate this electrical energy as heat. In this regenerative system, Siemens has redirected the electrical energy generated to the network.

**Driver’s eye view**

The new driver’s-eye view cameras being installed on the Class 444 fleet are placed above the driver’s desk, with a clear view of the track ahead. The forward-facing CCTV cameras are able to record video images, capturing trespassers, obstructions and other incidents, and assisting with track and conductor rail maintenance and monitoring. Using the trains’ new Wi-Fi connection, information can be fed to a central control room, allowing for real-time viewing with a driver’s-eye-view, and helping South West Trains and Network Rail maintenance and operations teams make faster and better informed decisions.

**Coupler heating**

Coupler heating provides protection from poor operation of train couplers when trains need to be joined together during cold and wet weather.

The coupler heater is temperature controlled, and switches on automatically in low temperatures. By ensuring the coupler is free of frost, excess snow and moisture, the number of coupling operation failures is reduced. The technology was first installed on the entire Desiro Class 444 fleet before moving on to the Desiro Class 450 fleet.

**Pro-active wheel bearing monitoring**

Pro-active monitoring of wheel axle bearings is driving up train service quality for passengers on South West Trains.

Maintaining train wheelsets is crucial for safe and reliable train operation. The axle journal bearing is a fundamental part of the wheelset, but can often be the component that fails first.

If this happens on a train in service, it could lead to delays, costly penalties, or even, on rare occasions, derailments or fires. Previously, a preventative interval of overhaul would be imposed, requiring the bearings to be removed and stripped for assessment, meaning that the many healthy bearings were needlessly examined and the full life of the wheelset could not be achieved.

Siemens now offers wheelset maintenance services to overcome this limitation – so that the axle bearing condition can be determined whilst in operation.

The services are based around the RailBAM Bearing Acoustic Monitor, developed by Siemens partner Track IQ.

RailBAM uses an array of microphones to listen to passing trains and identify developing defects within the axle bearings. If left in service, these defects would lead to the onset of failure of the axle bearing weeks or months in the future. Using RailBAM allows these bearing defects to be removed from service in a planned way, not affecting passenger service or train availability.

Using a secure internet connection from the microphones’ site, the data from passing trains is available real-time for review via the internet.

The system has been used in Swaythling since 2009 and Mortlake since 2011, and monitors the South West Trains / Network Rail alliance’s entire fleet. Over three years, the systems have identified about 40 bearings before failure.

This pro-active monitoring of bearings is a value for money system – it means that maintenance can be planned systematically, in-service failures reduced, maintenance intervals significantly extended, and train downtime minimised.

Train operation is safer and more reliable, and annoying and costly delays and penalties are minimised.

**Automatic Selective Door Opening**

South West Trains and Network Rail are investing in longer trains of up to 12 cars to carry more passengers in greater comfort on many routes - but short platforms at some stations mean that not all doors can be opened. Doors have to be manually controlled by the guard and can only be opened in sets of four cars.

Until platforms can be lengthened, Siemens is offering a technologically advanced solution via Automatic Selective Door Opening (ASDO). With this solution, the train automatically detects which station it has stopped at, and how many doors can safely be opened on the correct side of the train next to the platform.

This initiative will lead to greater comfort, safety and convenience for passengers, as more 12 car trains are able to operate, meaning increased seating capacity combined with reduced waiting times at stations.
Constructions between 2009 and 2011, the ScotRail Class 380 Desiro EMUs are a development of the original Desiro UK design, but with structural changes to meet newer crashworthiness regulations, and a number of elements that feature in the ‘next generation’ Desiro City design. The fleet is based at Glasgow Shields depot, where the sets are maintained by ScotRail with on-site support from Siemens under a Technical Support & Spares Supply Agreement (TSSSA). All maintenance is carried out by ScotRail, with higher level issues raised with Siemens which has 18 staff based on the depot: six technicians and a support team.

Supporting this is an Interworking Agreement which ensures that the teams from both Siemens and ScotRail work together on the fleet; sharing training opportunities, communication and development facilities with each other without either party seeking to make these opportunities and facilities a commercial activity. All performance data is collected and shared in a joint and open manner to ensure efforts are not duplicated.

As the agreement says, the commitment is all about aiming high to “Focus on the common goal of delivering excellent service to the passengers.”

The combined Siemens / ScotRail team is based in the same office and meetings are attended jointly. Steve Smith, Siemens Fleet Manager for the Class 380s, said, ‘our aim is to deliver excellent technical support and materials to ensure full service availability.’ For ScotRail the Class 380s are expected to be the flagship fleet, with the stated aim of becoming the most reliable train in Scotland and a MTIN (Miles Per Technical Incident) figure of 40,000 – an ambition that seems well within reach.

As part of the preparation for the fleet’s arrival in the UK, the core ScotRail team was taken to the Siemens facility at Wildenrath where they undertook preliminary training. This was followed by more intensive training in Scotland as the first sets were delivered. Tasks included removal and refitting of key components as part of a 6-month programme of preparation for the arrival of the full fleet. Under the Interworking Agreement, Siemens continues to provide regular training throughout the year.

The first unit entered service with ScotRail on 8 December 2010, and after a few ‘bedding-in’ issues, principally around software, the fleet has seen steady progress, with the latest MTIN figure standing at around 20,000 miles - the Class 380 received the Modern Railways Silver Spanner for the most improved reliability in its classification over the last year. This is in addition to the ‘Rolling Stock Excellence’ award it received when it first entered service.

Well received by passengers, with its spacious interior and airy feel, the 380 was also the first train in the UK to meet the requirements of PRM TSI – the new standard created to improve the travel experience for persons of reduced mobility, raising accessibility to new levels.

Initial software development activities were focused on driving improvements to the train control software. This has now stabilised and allowed next step software development activities to focus on improvement actions in other areas such as: diagnostic message feedback, train to shore communications and changes to functionality of energy metering, to name but a few.

Class 380 trains at Glasgow Central. Tony Miles

Scottish fleet improvements

Each software version has undergone laboratory development and testing before unit trials are undertaken. These unit trials assist in mitigating potential issues and provide assurance that no ill effects result from full deployment of the software package to the 380 fleet. These activities are heavily reliant on collaboration between Siemens AG, Siemens UK, the rolling stock leasing company (Eversholt Rail Group) and the train operator and maintainer (First ScotRail).

Siemens continues to work in partnership with ScotRail to deliver future upgrades, improve reliability and help address any teething troubles, common with a new fleet, quickly and efficiently.

Additional plans for Class 380 include upgrading the real time monitoring of the sets, and delivering further product improvements, such as an energy-saving Driver Advisory System.

Class details

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Siemens sponsors LU150

2013 is proving a momentous year for Siemens and London Underground. In the year that Siemens celebrates 170 years presence in the UK, the company is also a principal sponsor of London Underground’s celebrations to mark the 150th anniversary of the Tube.

A year-long schedule of events, activities, seminars and open-days kicked-off in January with heritage steam train runs recreating the very first passenger journey that took place on the Metropolitan line in 1863. All the events taking place this year have been designed to explore the Tube’s history and look at the role it will play in the future - both in the lives of Londoners and the economy of the City and broader UK.

The celebrations continued in February with the launch of the Siemens Poster Vote – a competition to find the UK’s favourite London Underground poster of all time.

Poster Art 150 – London Underground’s Greatest Designs is an eight-month long art exhibition, sponsored by Siemens. The exhibition features a dazzling variety of poster styles, showcasing designs from the late 19th century to the present - all created to advertise London’s unique Tube.

Selected by a panel of art and design experts and historians, 150 of the best designs are displayed in a unique exhibition at London Transport Museum in Covent Garden. Themes range from days out in the city and London’s countryside, to famous capital landmarks and events. Featured posters show how the Underground has kept London on the move with improvements in reliability, frequency and new technology. Posters on way-finding and etiquette show us how passengers have navigated the Tube. Poster Art 150 also features rare letter-press (a technique that involves printing words or designs with ink while simultaneously indenting the image) posters from the late nineteenth century.

Steve Scrimshaw of Siemens says of the exhibition, ‘Art is a really personal thing and everyone likes something different. With 150 different posters in the exhibition there is something to appeal to all tastes.’

Sam Mullins, Director of London Transport Museum, adds, ‘We’re delighted that Siemens is sponsoring this exhibition and helping us highlight how important graphic art has been on the Underground over the last century. There are some really iconic designs on display and I’d encourage people of all ages to come and visit the museum and help us choose the nation’s favourite poster.’

Later in the year, London Underground will take the opportunity to open up the disused Aldwych Underground station to the public for a series of special ‘residency’ evenings.
Siemens’ new train is green, flexible, comfortable, and safe

The Desiro City, Siemens’ new second-generation train design.

Desiro City takes shape

The Desiro City, a new second-generation train design for commuter, regional and inter-regional rail services in the UK, has environmental-friendliness, flexibility, passenger safety and comfort as its hallmarks - alongside value for money. The lightweight construction of the train and the bogies and an intelligent vehicle control system reduce the total energy consumption by up to 50% compared with the predecessors. The Desiro City has been developed over the last six years, in a research programme with an investment of over £40 million. Based on the proven, and highly reliable, Siemens UK trains and using real life UK experiences, it also draws on best practice from across Europe. Manufacturing planning for the new train is well advanced, with vehicle and bogie testing underway at Siemens dedicated test track.

Designed for real life
The train designers, manufacturers and maintainers have worked together as one team to ensure Desiro City trains are easy to maintain, have a long lifetime in service, minimise whole-life costs, and deliver the highest levels of reliability and availability.

Siemens Service Director, Steve White, says of the new train, 'The UK maintenance team has been fully involved in the design of Desiro City since 2007, feeding back the practical experience of train crew, cleaners, and maintenance technicians into its development. This is a UK developed train for use on UK networks, so it was essential for us to be involved right from the outset. Members of my team are awaiting the arrival of the first set like expectant fathers in a maternity ward.'

'Ve are now finalising our plans to localise certain aspects of the Desiro City component manufacture and assembly process, creating additional jobs and increasing rail industry skills in the UK.' Technologies, standards and European best practice were also analysed, with the goal of minimising weight and providing a simple but effective, and highly reliable design.

Flexible in design

Flexible in design and in service
The Desiro City design is completely flexible. There are options for a full width or gangwayed cab; sliding or plug doors; and wide gangways or doors between cars.

All the traction equipment of the Desiro City is integrated into individual cars. This means that the composition of the train - from three to 12 cars - can be changed easily.

The Desiro City interior layout can accommodate up to 25% more passengers than its predecessor, but is completely adaptable and can be adjusted to suit different journey lengths.

Weight reduction and energy efficiency
The Desiro City has been designed with energy efficiency in mind.

One of the most significant achievements is a drastic weight reduction: the new train is up to 25% lighter than its predecessor and can reduce primary energy consumption by up to 50%.

This has been achieved by optimising the weight of all components, improving aerodynamics, and introducing energy efficient innovations such as a Driver Advisory System. Intelligent heating, ventilation and air conditioning systems are equipped with sensors to automatically adjust to the passenger loading in each carriage.

The greatest weight reduction has been achieved by using an innovative, lightweight air-sprung bogie with two-level suspension. The inboard bearings make it much lighter than a conventional bogie - contributing to overall weight reduction (and therefore energy consumption), and an optimal wheelbase also significantly decreases wheel and track wear.

Despite its reduced weight, the Desiro City meets the very latest safety standards with dedicated 'crumple zones' for driver and passenger safety. The new train also features an innovative smoke management system to actively channel smoke away in the event of a fire. 'We will not compromise on safety,' confirms Steve White.

Lifetime costs
Flexibility and environmental-friendliness characterise this second generation Desiro, and with its innovative modular platform concept, life cycle costs can be reduced on a lasting basis. On-board diagnostic systems and train management systems will help achieve the highest levels of performance and service reliability. The Desiro City concept optimises proven components and integrates new technologies, with rigorous verification and testing procedures. In turn, this reduces maintenance and general service costs, so that whole life-cycle costs are greatly improved.

Thameslink Programme
Siemens and Cross London Trains (XLT) were selected in June 2011 as preferred bidder for the Thameslink Rolling Stock Procurement Programme, led by the Department for Transport. The programme covers the delivery, maintenance and financing of around 1,200 vehicles and the construction and financing of two depots. The DfT has now reached commercial agreement on the key elements of the deal with the XLT consortium and Siemens is working to achieve financial closure as soon as possible. When concluded, this will represent the largest order in the commuter and regional market ever awarded to Siemens plc and the first for the Desiro City platform.
XLT is a consortium consisting of finance partners Siemens Project Ventures GmbH, Innisfree Limited and 3i Infrastructure plc.
Eurostar drives ahead with investment

Eurostar is driving ahead with a £700 million investment in its fleet, which includes new Eurostar e320 state-of-the-art trains from Siemens, and a complete redesign of the current Eurostar fleet.

With customers increasingly opting for rail over plane for short-haul journeys across Europe, Eurostar plays a pivotal role in demonstrating the speed, ease and convenience of high speed rail travel. By providing an unrivalled travel experience between the UK and the continent, Eurostar’s ambition is to encourage more travellers to choose high speed rail as their preferred option.

The 10 new Eurostar e320 trainsets will complement the existing fleet and ensure Eurostar can deliver the best possible service to its passengers as it expands its operations.

Built to a bespoke specification, based on the Siemens Velaro, the new Eurostar e320 trains will be interoperable - designed to run across the European high speed rail network.

With capacity to carry more than 900 passengers, the Eurostar e320 will have 20% more seats than the existing Eurostar trains which carry 750 travellers. The new train does not have traction power cars - instead traction equipment and technical modules are distributed under floor throughout the train, and so the full length of the train is available for passengers.

The interiors and external livery of both the e320 and the upgraded existing fleet are being designed by Pininfarina to a specification unique to Eurostar. This design draws on extensive passenger feedback and will include a number of innovative features that will create an exceptional travel experience for customers.

In addition to offering a contemporary, stylish environment in which passengers can work or relax, the new Eurostar fleet will be equipped with the most advanced wi-fi and on-board “infotainment” on any train in Europe. This will include real-time travel and destination information as well as interactive entertainment including video-on-demand, music and newsfeeds.

A special Modern Railways supplement in association with Siemens
Poster Art 150
London Underground’s Greatest Designs

Exhibition from 15 February – 27 October 2013
London Transport Museum, Covent Garden Piazza