



**An Association for Retired Professional Engineers**

# **NEWSLETTER      August 2018**

## **President's Message**

Welcome to the August Newsletter.

We have now completed our busy programme of summer visits and are looking forward to the autumn and spring programme. Your committee has been working hard and you will see in the Newsletter details of our monthly talks, which I am sure you will find of interest.

Although the committee considered other options, it was decided to stay with the Windsor Hotel in Worthing for our Christmas lunch this year as it is a 'tried and tested' venue. I hope to see you there.

We do need 'new blood' to join the committee. We meet only three times a year in Rustington for a morning so it does not take up too much time. Why not come to one of our committee meetings as an observer? Please think about it, and if interested give me a call.

I look forward to seeing you at the AGM and talk on 18<sup>th</sup> September.

Derek Webb  
August 2018

## **PROGRAMME OF EVENTS    2018 - 19**

|                 |                                  |                                                                                                          |
|-----------------|----------------------------------|----------------------------------------------------------------------------------------------------------|
| <b>Tuesday</b>  | <b>18<sup>th</sup> September</b> | <b>AGM &amp; Talk – We plough the Fields and Clatter!</b>                                                |
| <b>Thursday</b> | <b>20<sup>th</sup> September</b> | <b>Coffee – at Spotted Cow, Angmering</b>                                                                |
| <b>Tuesday</b>  | <b>25<sup>th</sup> September</b> | <b>Visit - National Grid (Electricity National Control Centre)</b>                                       |
| <b>Thursday</b> | <b>27<sup>th</sup> September</b> | <b>Coffee – with Partners at Swallow's Return</b>                                                        |
| <b>Tuesday</b>  | <b>9<sup>th</sup> October</b>    | <b>Talk – Artificial Intelligence and the Two Singularities.<br/>(Held in the Pavilion, Field Place)</b> |
| <b>Thursday</b> | <b>18<sup>th</sup> October</b>   | <b>Coffee – at Spotted Cow, Angmering</b>                                                                |

|           |                              |                                                                                                              |
|-----------|------------------------------|--------------------------------------------------------------------------------------------------------------|
| Thursday  | 25 <sup>th</sup> October     | Coffee – with Partners at Swallow's Return                                                                   |
| Tuesday   | 13th November                | Cooch Memorial Lecture – Fusion Power – within our Grasp?<br>(Held in the Pavilion, Field Place)             |
| Thursday  | 15th November                | Coffee – at Spotted Cow, Angmering                                                                           |
| Thursday  | 29th November                | Coffee – with Partners at Swallow's Return                                                                   |
| Wednesday | 5 <sup>th</sup> December     | Christmas lunch at the Windsor Hotel, Worthing                                                               |
| Tuesday   | 18 <sup>th</sup> December    | Talk – Getting ships there – (note change of date).                                                          |
| Thursday  | 20 <sup>th</sup> December    | Coffee – at Spotted Cow, Angmering                                                                           |
| Thursday  | 27 <sup>th</sup> December    | <u>No</u> coffee at Swallow's Return!                                                                        |
| Tuesday   | 8 <sup>th</sup> January 2019 | Talk – British Tanks in the First World War: an engineering<br>and combat success but a procurement failure? |
| Thursday  | 17 <sup>th</sup> January     | Coffee – at Spotted Cow, Angmering                                                                           |
| Thursday  | 31 <sup>st</sup> January     | Coffee – with Partners at Swallow's Return                                                                   |
| Tuesday   | 12 <sup>th</sup> February    | Talk - The History of Westland Aircraft Ltd                                                                  |
| Thursday  | 21 <sup>st</sup> February    | Coffee – at Spotted Cow, Angmering                                                                           |
| Thursday  | 28 <sup>th</sup> February    | Coffee – with Partners at Swallow's Return                                                                   |
| Tuesday   | 12 <sup>th</sup> March       | Talk: The Loss of MH370 – what do we know; what can we learn?                                                |
| Thursday  | 21 <sup>st</sup> March       | Coffee – at Spotted Cow, Angmering                                                                           |
| Thursday  | 28 <sup>th</sup> March       | Coffee – with Partners at Swallow's Return                                                                   |

All Talks and Meetings will commence at 2.30 pm and be held in the Chichester Room, Field Place, Worthing unless another venue or time is indicated.

Timings for visits and outings will be as printed in the detailed description of the activity.

Coffee mornings commence at 10.30 am.

## Membership Subscriptions 2018/2019

These are due on 1<sup>st</sup> October 2018. Please send your cheque for £15 to the Hon. Treasurer, Tony Tomkins, 13 Milton House, Milton Road, Haywards Heath, RH16 1AG  
(Reply slip at end of newsletter.)

## Website of the RCEA

Our website, [www.rceasussex.org.uk](http://www.rceasussex.org.uk) carries the very latest information on all of our events. As we occasionally have to make last minute changes to our programme due to matters beyond our control, we recommend that you always consult our website.

## **GDPR compliance and receiving the newsletter by electronic means**

Members will note that in this edition (and all subsequent editions) of your newsletter we are omitting the contact details of new members in accordance with the requirements of the new data protection legislation (GDPR). Full member contact details will obviously be contained within the handbook, which members are encouraged to retain securely.

Members will recall that our membership secretary sent out an email back in May informing them that the GDPR was about to come into force, and requesting that each member individually replied to confirm that they were happy for the committee to hold their data for the purposes of the RCEA. To date 59 members have responded positively to this email, still leaving a number from whom we have had no response. Your committee now believe that a simpler way of complying with the intent of the GDPR is to amend our constitution such that payment of the annual subscription is acceptance that the member's personal data can be stored and used for the purposes of the RCEA. Accordingly we intend to submit the necessary rule changes at the forthcoming AGM for approval, and encourage all our members to attend.

We will also need to amend the 'Application for Membership' form to reflect the AGM decision and additionally add a further note to encourage new members to receive copies of the Newsletter by electronic means, which saves the RCEA a considerable cost in postage.

## **New Members and Speakers for Talks**

The RCEA needs new members to ensure that we can continue as a thriving organisation. Please think of appropriate people you know and encourage them to come along to our talks and hopefully join the RCEA.

We also need more members to give talks to us on Tuesday afternoons from September to March. We are aware that many members have the knowledge from their working careers to provide interesting talks. If you are willing to give a talk please let us know. Speakers from outside organisations are increasingly harder to find and often seek payment for their services.

## **New Handbook**

A new handbook is being prepared and it would be helpful if you let Mike Wooldridge - Mike.wooldridge1@btopenworld.com know if you have any changes to your address, telephone number, etc. This is particularly important if you have a new email address, as we now send out news updates and reminders of all our forthcoming meetings via email.

## **New Members**

Brian Barham, M CIBSE  
Rustington

Roy Preston, F Inst P, B Sc (Hons), Ph D, F Inst P, C Phys.  
Broadbridge Heath

Please contact our membership secretary, Mike Wooldridge, should you require contact details.

## **RCEA Insurance**

Members need to be aware that the insurance policy that the Association holds is solely for the protection of the assets and liabilities for the Association as an entity. The policy does not provide cover for personal injury nor loss to individual members. Members attend the Association's events at their own risk; although under some circumstances there may be some cover from the insurance arrangements of the venue owner.

## **Southern Retired Chartered Engineers (SRCE)**

We have received the following programme information from the SRCE. Members wishing to attend any of these events should contact the SRCE secretary Jeff Williams on 02380 897078 or e-mail jagwilliams@waitrose.com.

Tuesday 11<sup>th</sup> September – visit to Lacock Abbey Museum  
Tuesday 2nd October - AGM at Potters Heron Hotel, Ampfield  
November - Visit to Salisbury Playhouse, exact date TBA.

## **Brief Detail – Talks, Outings and other activities September 2018 – March 2019**

### **AGM & Talk**

#### **Tuesday 18<sup>th</sup> September – “We plough the Fields and Clatter”**

Sally Watts

Sally will give us a layman’s account of steam ploughing engines as a hobby. She mentioned in conversation with a workmate an interest in steam traction engines. Through that conversation she was invited to join the crew of a 20 ton ploughing engine. This led to a husband, and the acquisition of a Fowler ploughing engine in need of a complete rebuild and experience of steam ploughing under competition and demonstration conditions.

This is a personal account of the hard work and rewards of the steam hobby and the magnificent ploughing engines that fed the country in the First World War, their working, and the people who maintain those few which escaped the cutting torch.

Sally is a professional public librarian and small animal keeper who grew up sharing her father, Ray Parsons, love of miniature steam locomotives and the steam preservation movement.

### **Visit**

#### **Tuesday 25th September - National Grid (Electricity National Control Centre)**

Our visit to the Electricity National Control Centre has now been confirmed for 25<sup>th</sup> September. There is a maximum of 20 places available; we already have 20 people signed up following the announcement in the last Newsletter (before the date had been confirmed). If you wish, you can send Perry your details and you will go on a waiting list in case anyone has to drop out. The programme for the visit is as follows:

|               |                        |
|---------------|------------------------|
| 11:00 – 11:15 | Reception and coffee.  |
| 11:15 – 11:45 | Presentation 1 and Q&A |
| 11:45 – 12:15 | Presentation 2 and Q&A |
| 12:15 – 12:30 | Coffee break           |
| 12:30 – 13:00 | Viewing Gallery        |
| 13:00 – 13:30 | Refreshment            |

Please note that the ENCC is outside Wokingham and is best reached by car. Once we know who will be coming, Perry will publish contact details so people can arrange to share cars.

Contact Perry Eastaugh: 01903 788858, email [perry.eastaugh@icloud.com](mailto:perry.eastaugh@icloud.com) before Saturday 8th September.

Reply slip at back of newsletter.

### **Talk**

#### **Tuesday 9th October – “Artificial Intelligence and the Two Singularities”.**

Calum Chace, author of “The Economic Singularity and Surviving AI”.

This talk is about the possibility that the first machine with human-level cognition may be created within a few decades. If and when that happens, it will be closely followed by the arrival of the world’s first super-intelligence, and humans will become the second smartest species on the planet. Some years or decades before then, intelligent machines may render most humans unemployable.

Calum Chace thinks these two developments are so radical that they both deserve to be called “singularities”, a term borrowed from maths to denote maximum transformation. They are, respectively, the technological singularity and the economic singularity.

The consequences of human-level artificial intelligence (artificial general intelligence or AGI) would be astonishing. The consequences of technological unemployment, if it happens, will also be profound. Both these developments could have wonderful consequences for us – or terrible ones. And the outcome is largely up to us.

Calum Chace is a best-selling writer and sought-after speaker on artificial intelligence. He focuses on the medium- and long-term impact of AI on all of us, our societies and our economies. Before becoming a full-time writer and speaker, Calum had a 30-year career in journalism and business, in which he was a marketer, a strategy consultant and a CEO.

## Talk

### Cooch Memorial Lecture – Tuesday 13<sup>th</sup> November – “Nuclear Fusion – Within our Grasp?”

Robin Stafford Allen FIMechE

We are facing a growing problem with energy for the world population, which is growing at an astounding rate and as the standard of living is also rising, the demand for energy is rising faster than the population growth rate. The vast majority of the world's energy comes from fossil fuel. This cannot continue indefinitely as oil reserves are finite and Global Warming means we may face a serious food shortage if the climate changes radically.

Renewables are providing only a few percent of the energy for the world and almost all renewable with the exception of hydroelectric dams, are “in addition” to power stations and not “instead of” power stations and so cannot be relied upon for “base-load” energy supply continuously.

Nuclear fission has contributed a significant amount to the base-load supply, but there are issues with this technology, and so researchers are examining using Nuclear Fusion, the process that keeps the sun hot, as hydrogen is transmuted into helium releasing energy in the process.

The talk will cover this world energy issue and then move on to showing what Nuclear Fusion is, and how it is being researched using the machines in UK (JET) and the latest machine in France (ITER). Robin will endeavour to show the progress toward putting Fusion generated electricity onto the grid hopefully within our lifetime.

Robin joined Culham in 1992, and has worked in Cryogenics and in the Heating and Fuelling of plasmas on-and-off ever since. He recently spent a sabbatical six years as Director of Engineering for a small tenant company on the Culham site designing and constructing a large 1-metre-bore special superconducting magnet for the AMS-2 experiment (a mass-spectrometer) which was launched on the penultimate Shuttle flight to the International Space Station.

Two years ago he retired from working at CCFE on the mechanical engineering of the plasma-heating equipment for the ITER machine, and the British fusion research effort MAST machine.

He now works part time for the Institution of Mechanical Engineers and lectures part-time on Engineering at Oxford Brookes University.

## Christmas Lunch

### Wednesday 5<sup>th</sup> December 2018 - Windsor Hotel, Windsor Road, Worthing BN11 2LX.

The menu is shown below and early booking is advised due to the limit on numbers catered for. Applications should be received by **Saturday 1st December 2018** to ensure places. The cost this year is **£29 per person**.

‘Resident’ parking tickets can be obtained from reception if hotel car park is full. Handicap parking can be arranged by including car registration number with booking application.

Reply Slip is at the end of Newsletter.

## MENU

Spiced Red Lentil & Roasted Vegetable Soup with Vegetable Crisps  
Stuffed Mushrooms with Blue Cheese & Walnuts with a cranberry Sauce  
Smoked Seafood Pate with Horseradish and Beetroot Puree  
Honeyed Ginger Chicken Skewer on a bed of Leaves

.....  
Breast of Turkey, with Bacon Wrapped Stuffing and Cumberland Sausage  
Slow Roast Pork Belly with caramelised apple, bubble & squeak and Cider Gravy  
Sweet Potato, Winter Squash & Pine Nut Roast with a Chilli & Tomato Sauce  
Baked Salmon Fillet with Spinach, Lemon & Black Pepper Crumb with a Parsley Sauce

.....  
Christmas Pudding served with brandy sauce  
Coconut Panna Cotta with a Mango Coulis  
Chocolate and Black Cherry Torte  
Trio of British Cheese with celery, grapes and a selection of biscuits.  
.....

Coffee and Mints

### **Talk**

#### **Tuesday 18th December – “Getting ships there”.**

Antony Tomkins

We have had to change the date of this talk from that shown in our previous newsletter to avoid conflict with a Christmas event being held at Field Place on the original date.

The presentation will cover the changing faces of navigation and positioning systems for seagoing ships and the dominant influence of electronics and computers, and will touch on the future possibilities for greener propulsion power trains.

### **Talk**

#### **Tuesday 8<sup>th</sup> January 2019 - “British Tanks in the First World War: an engineering and combat success but a procurement failure?”**

Geoffrey Vesey Holt MBE

The first tank, Mother, first moved in January 1916 and was a remarkable engineering achievement. Her children and grandchildren, the Mark IV and V respectively, enabled the return of surprise and success to the British Army at the Battles of Cambrai (November 1917) and Amiens (August 1918). The later battle inflicted a decisive defeat on the Germans.

The successful development of the first tank was due to a combination of leadership and engineering skills. Winston Churchill played a key role as did three engineers: d'Eyncourt, the Director of Naval Construction, Tritton and Wilson. However by the end of the war the British Army had almost run out of tanks due to a failure to maintain production.

Our speaker, Lieutenant Colonel (Retired) Geoffrey Vesey Holt, was educated at the Lycée Français de Londres and is a graduate of Durham University. He was commissioned into the Royal Tank Regiment in 1974.

### **Talk**

#### **Tuesday 12<sup>th</sup> February 2019 – “The History of Westland Aircraft Ltd”**

Bill McNaught

The history of Westland Aircraft covers the 70 years from its inception by ‘ironmongers’ Ernest and Percival Petter in 1915, through its fixed wing design and production period ending around 1948, and finally its far sighted decision to initiate helicopter production. It concludes with the infamous ‘Westland Affair’ of 1986 which has led to major changes in ownership. The talk will also include some of Bill’s own reminiscences from 25 years with the company.

### **Talk**

#### **Tuesday 12 March<sup>th</sup> 2019 – The Loss of MH370 – what do we know; what can we learn?**

Ian Gilbert, Avionics Consultant

Synopsis yet to be confirmed. See our website for latest information.

## Reports

### Outing

**Tuesday 24<sup>th</sup> April 2018 – Amex Stadium, Brighton**

Up until our visit I was not a football fan in any shape or form, but I could not help but soak up some of the atmosphere during the tour and feel some of the excitement from being in the home of a Premier League (PL) team. Much of this was due to our guide, Pauline Anderson (pictured opposite) whose excellent commentary I found just right, bearing in mind that I don't know any facts about football apart from the names of Stanley Mathews and George Best.



We were told that the stadium has several dining rooms, the largest seating 500. BHA (i.e. the club) hires them out for weddings and other events when not needed for a match event. It was also interesting to note that an ordinary member of the public can turn up for a 2 course Sunday lunch for £22.50.

Each of the ten private boxes has its own 10 person dining table, and costs £45k for a season – good value, compared with some of the big London clubs that charge ten times more. Season tickets cost between £500 and £800, but this includes free travel from various park and ride pick up points, and even train stations (eg Eastbourne). An away game ticket costs £30. In addition to a number of corporate sponsors, and ‘family’ investments from the Bloom family, another significant revenue stream is from Sky, which, since the club’s promotion to the PL results in £95m at the start of the season plus £1m per game thereafter.

The stadium now seats 30,000 in comfort, of which 3000 are reserved for away team supporters. There are TV studios, commentator positions (now increased to over 60 since promotion to the PL), and even 10 ‘analysts’ who monitor the medical condition of the players (each player is fitted with a chip), as well as game movements. It was interesting to note that one particular player, who is exceptionally active on the pitch, typically covers 14km during a match!

We were shown round the changing rooms and noticed the differences between those of the home and away teams! The home team has more space, more facilities, comfortable seats, hot and cold baths (11°C, and 36°C) etc. The away team have pretty spartan facilities, but apparently this is normal at most football stadiums as it is part of the psychological

battle! To add to this, the speakers blast out ‘Sussex by the Sea’ as the players march out of the tunnel. Our guide turned the speakers on for us, and we experienced the same sensation! This sound effect was effectively demonstrated during our visit by the presence of two pedestrian controlled motor mowers mowing the pitch. They were standard, relatively well-silenced machines, but up in the stands the sound of their exhausts seemed to fill our ears.

The stadium itself is magnificent – and has huge gently arched roofs. These not only keep the spectators dry but also seem to contain the sound, thus enhancing the spectator experience.

Opposite we see our membership secretary and another guest sampling the roof-top view in the stadium.

The mower - groundsman each walk 7km during their cutting sessions, which can number 3 per week. Presumably they do other things when the pitch is completely re-seeded (not turfed) every year between May and August.



Overall this was a great visit to an interesting venue.

Mike Wooldridge

## Visit

### Thursday 3<sup>rd</sup> May 2018 - Ford Technical Centre, Dunton

When we visited the Ford Dunton Technical Centre last year we were only able to see a limited number of areas in a very large and complex Engineering Research and Development Centre. Fortunately Ford kindly agreed to a second visit this year concentrating on Component, Exhaust Emission, Engine and Track testing. Most of the components and vehicles that we saw were prototypes and photographing was not permitted: the pictures in this report may be from non-Ford libraries and/or archives.

As most of us had visited the site last year we chose to spend more time in the test areas and did not have the introductory talk. Please refer to last year's visit report for background information on the site. We were, however surprised when we received an urgent phone call, before we arrived during lunch, wanting to know the shoe sizes of everyone. We were left wondering what this visit would entail.

The Ford Research and Engineering Centre, as it was originally called, was the largest and most comprehensive engineering centre in Europe when it was opened in 1967 (see opposite). Many isolated responsibilities and facilities were incorporated on a greenfield site and the building included more than 270,000 sq.ft. of office space, 354,000sq.ft. of workshops and test facilities, and a 45,00sq.ft. of design studios. I started work there in 1968 almost 50 years ago.

Tremendous changes in all aspects of car technology and development have taken place since then and Dunton has had to change in order to remain a Centre of Excellence.





Billions of pounds of investment have more than doubled the size of the buildings (see left) and installed state of the art facilities in many areas.

All the drawing boards of the sixties (see right) and single main-frame computer using punch card input have been replaced with thousands of computers.



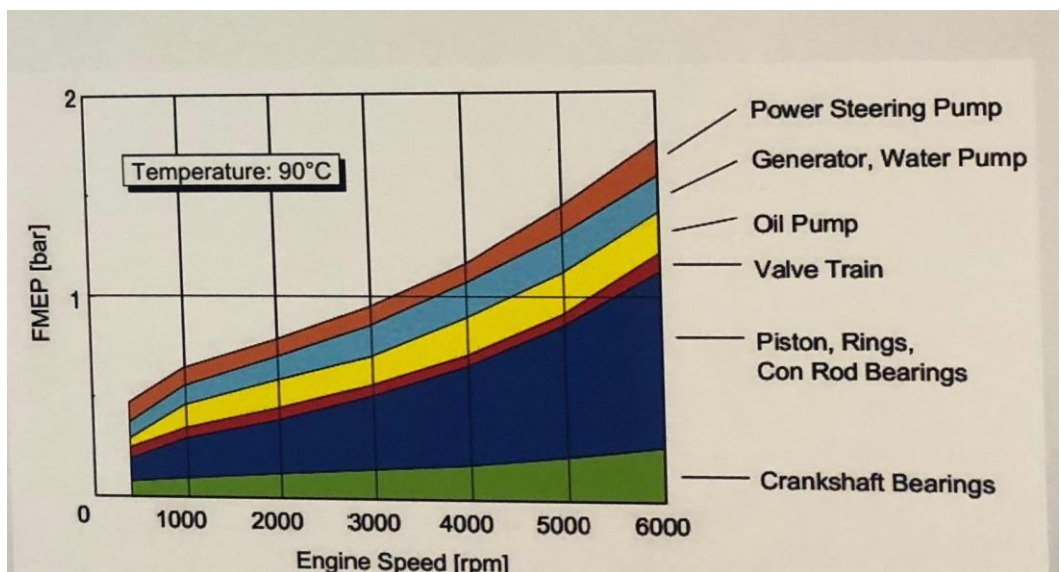
## POWERTRAIN PERFORMANCE AREA



However the first area we were shown seemed to have changed little since its installation and no one could remember when that was! Obviously no manufacturer could afford to ever have a flywheel disintegrate, so this test is mandatory. The Flywheel burst test equipment (see opposite) was located in the Powertrain Performance area. Production samples of flywheels are subjected to 5 heat cycles up to 650°C (800°C in some cases) alternating with forced air-cooling to simulate extreme use. They are then mounted in the heavily strengthened rig and spun at up to 14,000rpm before being crack tested.

There was evidence that in many cases in the past failures had occurred scarring the internals of the rig. This test appeared to have been standardised for many years and how well it suited modern materials and engines was unclear, but CAE alternatives were being evaluated

We were still wearing our normal shoes and moved on to an Engine Component friction Test Facility where 3 rigs were available to evaluate the contribution to an engine's friction of various components (see opposite).



The internal and ancillary friction of an engine is a very significant factor in the fuel economy of a vehicle particularly at low speeds and loads. These rigs enable the design engineer to isolate individual components and measure the friction of them

more accurately. The engine is motored by an electric motor through a torque measuring system in a variety of different build configurations and by comparing the results, the frictional contribution ascribed to individual sub-systems can be deduced. The main components of concern are camshaft profiles, springs, bearings, drive system and materials, crankshaft and balancer shaft bearings, lubricant and coolant pumps, and Front End Ancillary Drives.

Other engine test rigs that we did not see run for 1,000 hrs without stopping, except for checks, accelerating and decelerating between idle and a high no-load speed to test the durability of Front End Accessory Drives.

Pistons and piston rings can also be studied, but to a lesser extent, as combustion temperatures and pressures are not accurately simulated on these motored rigs.

These and other rigs are also used to confirm and ensure that any damaging natural frequencies (such as valve bounce) do not occur within the engines' operating range. Valve timing and lift are developed on live engine test rigs in the Engine Laboratory

## BODY DURABILITY



From here we moved on to the Body Durability section expecting a change of shoes, but it was not necessary.

This is where thousands of miles of real-road durability are simulated in a few weeks on what Ford call Floating Body Rigs (see left).

Each wheel of the vehicles on test is controlled by three hydraulic rams that provide appropriate up and down, fore and aft, and side to side forces. The rigs can run unattended and bodies are inspected for cracks, spot weld failures, poor welding, stress raisers etc. regularly. Using these rigs reduces the body design and development time and cost in many ways. Someone asked whether corroded bodies are also tested: answer 'no'.

Ford has many durability surfaces that have been developed for and from all their worldwide markets. Vehicles are designed to survive a calculated lifetime on these surfaces depending on local conditions. They have all been surveyed and rebuilt at their proving grounds mainly in Europe and the USA.

Some of these are very specific such the "Lower Dunton Road" that most of the Dunton managers drove to and from work on! Others are far more testing and very uncomfortable, if not dangerous, for the drivers (see right).

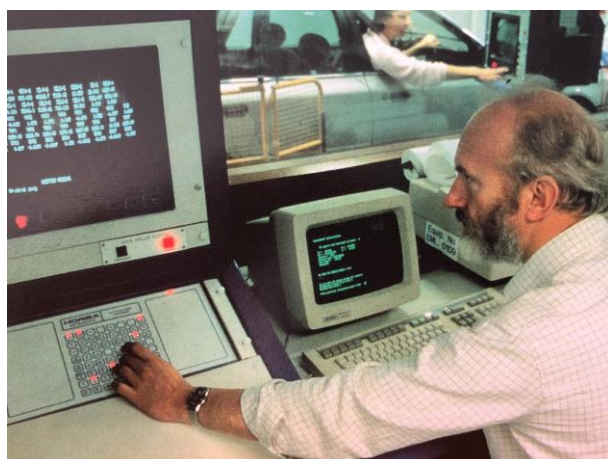
The data from these surfaces has been encapsulated into specific programs that can be fed into the Floating Body Rigs and concentrated into the most damaging modes.



## EMISSIONS LABORATORY

A short walk along the featureless, grey corridor and we arrived at the Emissions Laboratory and eventually found out why we needed to change into safety shoes. Vehicles have to be moved from one area of the laboratory and there is a danger that they could run over your toes! I am not certain what we were expecting but it was a bit of an anti-climax.

There are 13 chassis dynamometers fully equipped with the latest certified emission, particulate and fuel economy measuring equipment. Emission results are very sensitive to temperature. In order to ensure repeatability, all the vehicles need to be heat-soaked at predetermined temperatures and a large part of the facility is used to this end. This heat soaking requirement means that only one test per day is normally possible. In order to speed this up some development tests can be run back to back by piping cooling fluids through the critical components.



Emission results are far more variable than most vehicle parameters and the greatest variability is always the driver. He has to sit in the test car and follow the target drive cycle speeds using the throttle pedal while the chassis dynamometer applies load simulating road conditions. This is very difficult to do repeatedly and I was surprised to find that almost all the tests still use a human driver, 25 years after I was last involved. However they do use robot drivers for tests that warrant the extra time spent on setting up the robot.

Shown opposite is an early emission control room.

Whereas they used to have a large part of the Laboratory housing an emission test facility that could be depressurised to simulate emissions at altitude such as Denver, Ford have now determined that the space could put to better use, and hence altitude simulation is now done solely by reducing the engine intake pressure. Similarly, humidity testing is done solely by controlling the engine intake air.

Due to lack of time we were unable to see the “on road” emission testing area. The emissions equipment in the laboratory has been massively downsized to enable real world emissions to be measured.

The picture opposite shows a non-Ford vehicle undergoing emission testing on the road.

Again due to time constraints we were unable to discuss the variation caused by varying road conditions compared to the controlled conditions in the laboratory which must be a great concern.



## ENGINE LABORATORY



We were then shown the west wing of the Engine laboratory, which has been added to the 80+ engine dynamometers in the main building. The equipment here is a million miles from what it was 50 years ago, when measuring fuel consumption meant using a stopwatch to measure the time to consume a visible volume of fuel in a calibrated glass tube along with the fire hazard, fumes and variability of the old system.

The picture opposite shows a 1970s control room (note the analogue torque read out)



The new control rooms were packed with large displays continuously monitoring a multitude of measurements (see left). The engines are palletised (see right) so that the time-intensive instrumentation and pipework can be fitted external to the expensive test bed thus improving utilization of the test bed.



Some of the beds have enhanced control systems enabling them to simulate vehicle emission test cycles including gear changes (see opposite).

Temperatures between  $-30^{\circ}\text{C}$  and  $+50^{\circ}\text{C}$  can also be achieved repeatedly.

Other beds are equipped to test the complete powertrain by absorbing the power at the wheels rather than the engine flywheel and can take complete vehicles.

The test beds are fully safeguarded and run unattended overnight when doing durability tests of up to 1,200 hours duration.



## TEST TRACK



The final facility we saw turned out to be the highlight of the trip, the “high speed” test track.

‘High speed’ in this case is relative to the other test tracks at Dunton and not relative to Millbrook, MIRA or Nardo.

Ford of Europe has its main testing ground at Lommel in Belgium but maintains a much smaller facility at Dunton (see opposite) to avoid the delays and costs of shipping vehicles there.

The two central flat lanes run parallel to each other and are connected together by two, banked loops with hands-off speeds of 75 kph using 26 degree banking. This enables average speeds much higher than 75 kph if required.

Testing carried out includes Noise, Vibration and Harshness, Calibration, Rattles and squeaks, Booms, Braking on split friction surfaces, Wading, Handling, Lane change, wet road handling, turning circle and figure of eight handling (see opposite).

Nowadays data logging can easily be carried out on board the car itself. We were shown a photo from the past featuring a second car connected by a festoon multi-core cable on an elastic support cable – pretty important to keep station behind the main car!



We were then invited to experience high speed runs on the test track in two five litre Ford Mustangs (see opposite the rather full engine compartment of the Mustang). The test drivers obviously enjoyed their work and were in no hurry to finish work that day! Mike noted a peak speed of 223kph (139 mph) on his test run.

Overall, this was a most interesting visit and Ford apparently considered us the most informed and inquisitive tour party (again). Many thanks to Ruth, our guide, for all the strings she pulled to arrange this second visit.

Many thanks are also due to Mike for providing the minibus transport (Ford Transit Tourneo of course) for the majority of our party.

Ivan Farrow

## Visit

### Thursday 7th June - Three Bridges Maintenance Facility

Siemens UK kindly arranged for 18 members to visit the recently opened Three Bridges train care and maintenance facility.

We were welcomed by Graeme Clark, Head of Business Development, Rolling Stock, Siemens Mobility Ltd. He gave a presentation on how Siemens is positioned in the UK and the fleets of mainly electric trains it has supplied and, in many cases maintains, on behalf of the Train Operating Companies.



The picture above shows an internal view of the maintenance depot with the raised walkways to give access at both door level and roof level (on the left) for the pantograph etc.

The picture below shows a view from the air of the depot located on both sides of the Brighton Main Line with the branch to Horsham to the right.

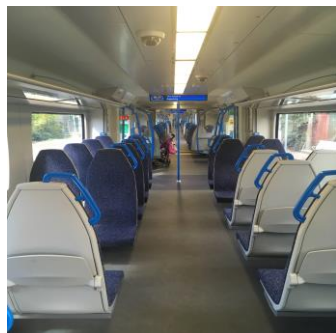


In the UK, over 450 Siemens trains travel more than 80 million miles a year.

Our speaker was particularly pleased that Siemens had been announced as Preferred Bidder on 15<sup>th</sup> June to supply the following to Transport for London (TfL) :-

- 94 x 9-Car Trains for the Piccadilly Line
- This is the first Upgrade Programme which will modernise four Tube lines – the Piccadilly, Bakerloo, Central, and Waterloo & City lines
- While this order is for an initial 94 trains, the contract will be awarded on the expectation of a single manufacturer building the trains for all four Deep Tube lines. Creating a single train design

First units to be delivered to London Underground for testing in 2023, first units to enter service in 2024.



We were then given a technical presentation by a young graduate engineer on the new Siemens Desiro City Class 700 fleet (see pictures opposite) for the Thameslink and Great Northern routes. The electric multiple units are maintained at Three Bridges and at an out-base at Hornsey by Siemens and operated by Govia Thameslink Railways (GTR).

The total fleet size is 115 trains comprising a mix of 12 and 8 car lengths, the latter for trains originating in South London. The contracted availability is to provide 101 trains in daily service.

The signalling arrangement on the core route from south of London Bridge and north of St Pancras was explained. It is a European first, whereby Automatic Train Operation (ATO) is overlaid on the European Train Control System (ETCS) level 2. The ATO means that the trains are 'driverless' ensuring the acceleration and braking are maximized by taking out the human factors. This is to ensure that the throughput of 24 trains per hour can be achieved. The paragraphs below are a report in the technical press.

*Working with Network Rail and Siemens, commuter operator Govia Thameslink Railway has successfully operated its first passenger-carrying train using ATO over ETCS Level 2.*

*On March 17 a southbound eight-car Thameslink train to Three Bridges operated automatically through the cross-city core between St Pancras, Farringdon, City Thameslink and London Blackfriars, transitioning into ETCS Level 2 on its approach from Kentish Town and back to conventional signalling between Blackfriars and Elephant & Castle.*

*GTR is using Grade of Automation 2, with the driver checking the platforms, closing the doors and initiating departure from each station. The Siemens-built Class 700 EMU ran between stops using the ATO and cab signalling, opening the doors automatically at the next station.*

*'This is a real "world first" and I'm delighted', said GTR's Systems Integration Manager Jim Doughty. 'It is the culmination of a programme which has been running continuously since the start of the £7bn Thameslink Programme. This cutting-edge system will allow us to run our high-intensity Thameslink service of up to 24 trains/hr each way, offering 70% more seats through the centre of London'.*

*The project partners have run nearly 200 night and day shifts of testing since April 2016 when dynamic proving trials began at Network Rail's ETCS National Integration Facility at Hertford North. Testing of ATO over ETCS started in November of that year. ETCS Level 2 has been overlaid on the conventional lineside signalling through the Thameslink core, with short blocks allowing trains to operate at closer headways.*

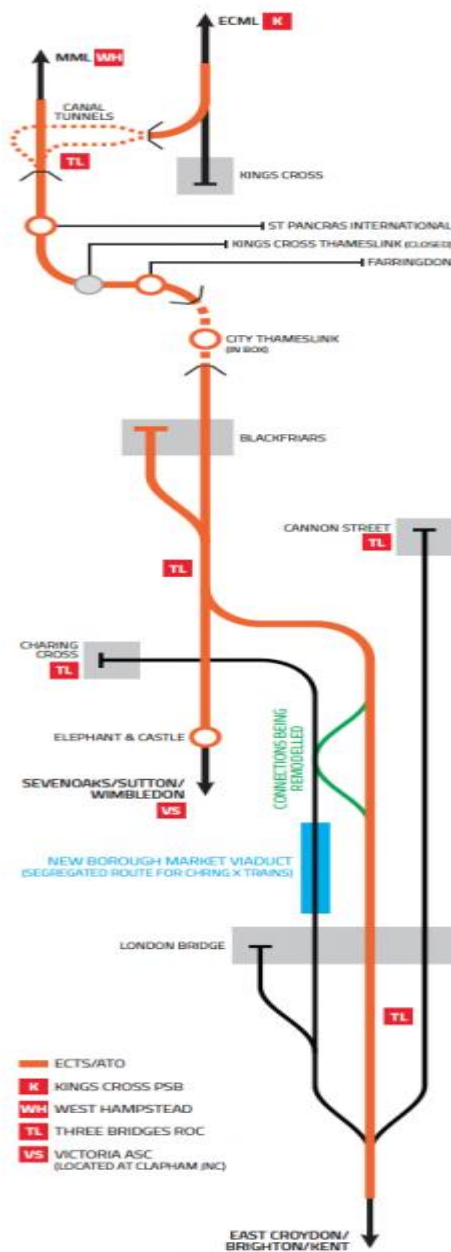
*GTR has had to demonstrate to the regulator Office of Road and Rail (ORR) that it has amended its Health & Safety Management System to operate trains in passenger service using both ETCS and ATO. It has also started a comprehensive driver training programme ready for the launch of full ATO working between St Pancras and Blackfriars at 22 trains/hr from May 2019 and through to London Bridge from December 2019.*

*Network Rail reported that on Monday 26 March 2018 the 09.46 service from Peterborough to Horsham, one of the new routes opened up in May, ran under automatic train operation (ATO) between St Pancras International and London Blackfriars.*

Thameslink trains will in future use the technology, developed by Siemens and operating on Network Rail's new digital signalling system, to run between London St Pancras and London Blackfriars at a rate of a train every two to three minutes – a frequency never before achieved on Britain's railways.

The Siemens in-cab system uses optimum acceleration and braking on board the Class 700 Thameslink trains while maintaining a smooth ride for passengers. The driver remains in the cab to check the platforms at stations, close the doors, and manage the overall safe operation of the train. ATO works with Network Rail's new digital signalling system, which means that trains can safely travel closer together through the central section of London with knock-on benefits for hundreds of thousands of passengers across the wider network.





The diagram opposite shows the arrangements for the core route. It shows the track layout and the signalling centres involved.

We then put on our safety boots and high visibility tabards before entering the depot shop floor. We were first shown the underfloor equipment on a class 700 by walking at ground level to see the bogies and the underslung traction equipment.

We moved to an adjacent train and stepped up and entered by the cab. We split into two groups to have an explanation and demonstration of the displays available to the driver.

We exited the covered area and were conducted by another young engineer to the underfloor wheel lathe where its operation was explained. Later the Depot Manager explained that the wheelsets of the class 700s were performing well even though the miles run has increased rapidly. There had been no need to use the wheel lathe so far.

It was a very informative visit and we are grateful to Siemens UK for the arrangements they made for us.

Derek Webb

## Visit

### Thursday 5th July – Volk's Electric Railway, Brighton

A total of 18 RCEA members, wives and friends shown opposite joined the visit, which started with an introductory talk by our guide, Jo. She gave us an insight into the life of Magnus Volk, a 19th century inventor and engineer. The son of a clockmaker, he set up the first telephone line in the city in 1879 and pioneered the early use of electricity. He brought electricity to his own house in Dyke Road and in 1881 Brighton Corporation commissioned him to illuminate the Royal Pavilion in the same way.



With these projects behind him, on 14 June 1883 Magnus Volk wrote to Brighton's town clerk seeking permission to lay an electric railway near Madeira Road (now Drive). After some deliberation this permission was granted and on 4 August 1883, after a construction time of only 6 weeks, Magnus Volk's electric railway was formally opened on Brighton sea front by Mayor Cox. This short demonstration line was very different to today's operation, being 2' gauge and ¼ mile long. It ran from a site on the seashore opposite the Aquarium to the Chain Pier. Power was provided by a 2hp Otto gas engine driving a Siemens D5 50 volt DC generator. The small electric car was fitted with a 1½hp motor giving a top speed of about 6mph. Shortly after that, he got permission to extend the line eastwards from the Aquarium to the Banjo Groyne.



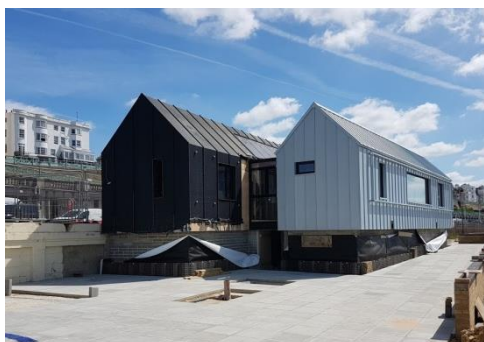
He also secured the rental of the 'Arch' at Paston Place (shown opposite) to provide workshop and power facilities. Following experience gained from the first line he also decided to widen the track gauge to 2'8½", and he designed two more powerful and larger passenger cars. He installed an uprated power plant in the 'Arch' consisting of an Otto 12 hp gas engine powering a Siemens D2 dynamo at 160 rpm. This gave an output of 160 volts at 40 amps – more than sufficient to propel the two new cars along the 1,400 yard long line. Volk wanted to extend the railway from Paston Place to Rottingdean but the Corporation wouldn't let him run the railway along the top of the cliff so, in 1892, he obtained permission to run the line along the sea shore for some 3 miles, about 400 yards out from the cliff.

The line was powered at 500V and an 18' high vehicle ('Pioneer' aka 'Daddy Long Legs') was designed to run on it (see opposite). Because the vehicle ran through the water at high tide, the driver was designated the captain of the vessel. An opening ceremony for this line was held on 28th November 1896. The line consisted of 2 tracks and vehicles (or vessels) could operate at 4mph at low tide and 1mph at high tide. Less than a week later on the night of the 4th and 5th of December a severe storm, destroyed the old Chain Pier, badly damaged the original electric railway and all but wrote off this brave new enterprise. Pioneer had broken from her moorings and by morning she lay on her side broken almost beyond repair.



However, she was repaired, modified to increase her height by 2ft, and the line reopened some 7 months later. Officially, Pioneer was classified as a sea-going vessel. This meant that it was the only railway in Britain that had to be staffed by a driver who was also a qualified captain of a sea-going vessel. Although popular, Pioneer was somewhat underpowered. Eventually, Volk had to close this part of the line when the Corporation decided to construct a beach protection barrier; he did not have the funds to divert the line. Following the failure of this scheme, Volk obtained permission to extend the line to Black Rock, giving a total length of 1¼ miles. Magnus Volk died in 1937, a fortnight after he had opened a new station at Black Rock.

The Corporation took over responsibility for the line in 1940. During the war it was closed and, by the end of the war it was in poor condition. After the war the Corporation decided to re-open the railway and, after suitable repairs and refurbishment, services were reintroduced in May 1948. By the turn of the century, the railway was just about surviving with the help of volunteers, but was in a precarious position. In 2015 things changed with a Lottery Fund grant of £1.65 million to see the line refurbished and rolling stock repaired.



The work included the construction of a new Aquarium station, shown opposite, which includes a visitor centre. The building is said to represent two trains passing, and houses a number of displays relating to the history of the line, including a film clip of the amazing ‘Daddy Long Legs in action, as well as a meeting room where we had our introductory talk.



We rode out along the line to Black Rock on car 9 (left), which had originally been built in 1910. The other car in service on the day was No 4 (right), one of the oldest surviving cars (built 1892): it was one of three that had been restored by Alan Keef Ltd as part of this project.



The new workshop, shown right, built courtesy of the Lottery Fund was a vast improvement on the time-expired structure it replaced. Inside was No 6, another of the restored cars (built 1901), which was in the final stages of fitting out before going back into service. We were told that, while electronic sensors can be used to provide a ‘dead man’s handle’, these can be expensive. One of the team had designed a much cheaper alternative, using a magnetic card attached to a lanyard. If the driver falls, the card pulls away and the train stops.



From the workshop we crossed the road to see Magnus Volk’s original office and workshop at the Arch, 285 Madeira Drive. We couldn’t go up to his office, but the workshop on the ground floor looked very much as it would have been in his time. Next to it was a rectifier room housing two 110A, 110V supplies.



We were also told about one of Magnus Volk's many other interests – electric cars. The photograph opposite shows him at the controls of an electric dogcart which he built in 1887 sitting outside this office building. Later he produced an electric car which was bought by the Sultan of the Ottoman Empire. According to our guide, Volk delivered it himself!

Back at the Aquarium Station, we should have had another talk on Volk's Engineering Heritage. Unfortunately, the Association didn't have anybody available who could give that talk, though they did bring back the volunteer engineer who had already shown us round the workshop at 285 Madeira Drive to answer any final questions. Despite this hiccup, we had a very enjoyable visit, assisted by the glorious weather.

Perry Eastaugh

## Visit

### Tuesday 17<sup>th</sup> July 2018 - New Holland Tractor Plant, Basildon

This visit was organised rather quickly when I became aware of a rumour that the Tractor plant was soon to close and the work was to be transferred elsewhere. The rumour has, so far, proved to be untrue!

Unfortunately the mid year date did not suit as many people as we had hoped and we opened it up to the SREK group in Kent. They were keen to attend and so the visit exceeded its breakeven total of 10 (by 5).

The plant was built by Ford in 1964 and was renowned for its iconic onion shaped water tower (opposite) that was visible from afar, but proved surprisingly difficult to see on our tour. It became Ford New Holland in the 80's and then Case New Holland when Ford pulled out of tractor manufacturing and is now known as New Holland, a brand of Case New Holland that is majority owned by Fiat.

When I was at Ford Dunton (just a few miles away) I was involved in minor collaboration exercises with "Tractors" to see whether any opportunities to use each other's engines existed. However the tractor engines tended to be more heavily built and not suited to the Ford Truck range: in addition Ford were moving out of the heavy truck market.

After leaving Ford I worked for a short time integrating much more modern and lighter engines from the Fiat truck range into CNH tractors. One of the problems was that these engines were too light, as tractors need their weight for traction in the fields and consequently large amounts of ballast were needed.





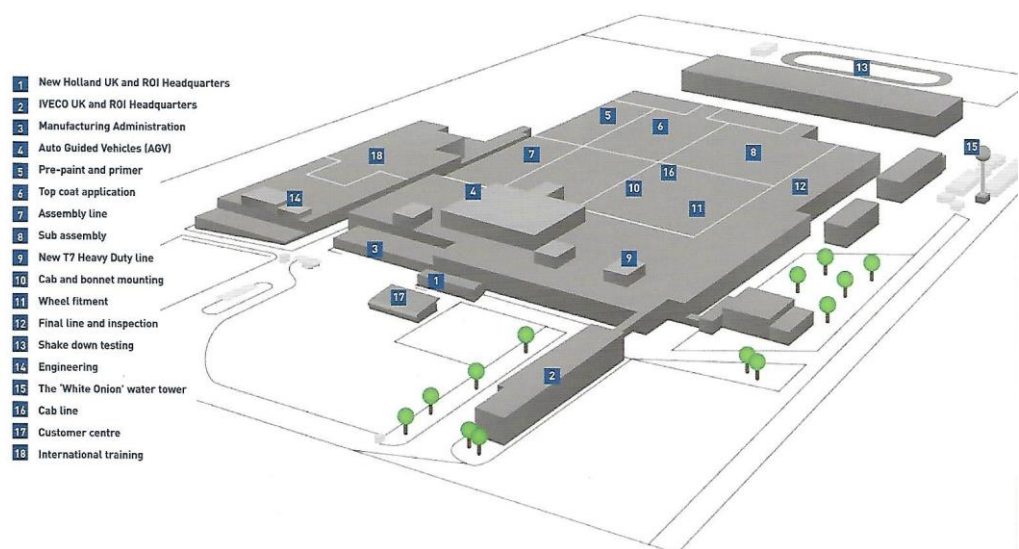
Before the days of electronic controls, smoke and soot from the combine harvesters at the point when the clutch was engaged and the turbos hadn't spooled up was a massive problem. We used to joke that we could measure it in bucketfuls when standing on the top of the combines monitoring the exhaust with an opacity meter! During the visit I was pleased to find that agricultural machinery now has to meet strict emission controls similar to road trucks. I was hoping to revisit the engine test beds but found that all engine development and production had ceased with the importing of engines from Fiat.

The Basildon plant is now owned by Fiat who in turn no longer produce Fiat tractors (terra cotta colour), nor does the Ford tractor brand exist today. About 80% of the plant output is New Holland (blue), and 20% is Case (red). It is interesting to note that whilst the two brands are virtually identical, many farmers are still brand sensitive and maintain their respective brand loyalties.

As regards UK competition, it seems that Case/New Holland are currently a close second to John Deere.

After our introductory presentation by our hostess, who not only knew the history and horsepower of all the Basildon models through the years, but was also a farmer's daughter and hence spoke with some passion and nostalgia as photos of the various models were put up on the screen, we toured the plant. The content of the talk covered the history of the plant and lasted about half an hour.

Then we set out on the tour of the plant (opposite). We donned our yellow tabards and safety glasses (but not safety shoes, as we were told that these would not be necessary so long as we kept within the yellow lines defining the walkways) and set off into the factory. One should also mention here that we were each issued with a headset and receiver so that our guide could talk to us when we were spread out and in a semi-noisy environment. The technology worked very well.



Our first impressions were that the plant was not very noisy and there were fewer people than some of us expected. The lack of urgency and slow pace was more reminiscent of Rolls Royce than the modern urgent stress pace of Ford or Rover.



In front of our eyes we saw a slowly moving, overhead conveyor chain carrying bare tractor chassis, with axles sticking out at each corner (see opposite). 'Paintable components' are then bolted onto to each chassis, before the assembly is washed, certain parts are masked and then the whole is fed into the robot spraying paint shop. The factory also utilized AGVs carrying complete tractor powertrains (see below)



The sight of robots, 'clothed' to keep the paint off and making speeded up human-like movements, can still seem slightly unnerving to those not used to it (see opposite). But they rapidly apply grey primer followed by black, electrostatically charged polyurethane paint – before the assembly then gets a final touch up by a couple of humans. The painted assembly is then baked for 20 (?) minutes at 112 degrees (presumably °C).



Meanwhile cabs are being assembled. Apparently every tractor is different, and we did not quite grasp the intricacies of how each individual spec gets converted into the right bits at the right assembly point. But it seems to work, and if an assembly does end up wrong for any reason, it gets taken into a garage area at the end of the line for individual corrective work. There is also a much shorter, slower moving line for the larger, less frequently ordered, tractors. Operators here have 1 hour at each workstation to add bits (cf 4.5 mins on the main line) and hence have a greater variety of work.

During our visit the main production line was producing 85 tractors/ day for shipment all over the world – including about 8% to the UK. By employing extra people and increasing the line speed at the workstations they could increase this to 120. An assembly takes 15 hours from start to finish. Typically, assembly workers are trained in 3 jobs so that they can move around to accommodate holidays, sickness (and boredom?). Nearly all parts are bought in from other European factories with stock piles as follows: 3 days for large items, 6 for medium and 10 for small. They had tried “Just in Time” but found it unworkable.

Some other statistics provided on our tour were that over 1.6 million tractors and 3.1 million engines have been manufactured on this 40 ha site which has over 2km of assembly lines capable of producing 16,000 different tractor specifications for 120 export markets.

There were plenty of posters addressing things like Total Quality Management, Kaizen problem solving and World Class Manufacturing. We were shown a table of exhibits entitled ‘Poka Yoke’ (Japanese for ‘fit one way’) which basically means trying to make each piece of assembly work ‘fool-proof’. eg how to devise a way of stopping workers from bolting a hydraulic pipe in the wrong way round.



Tractor engines (see opposite) are pretty sophisticated nowadays in order to comply with emissions regulations. Most of the tractors we saw were designed for ‘Tier 4’ of the regulations, but I particularly remember one which was destined for Ukraine only having to meet ‘Tier 3’.

Most of the tractors were blue, similar to the old Ford colour, but now specifically New Holland blue (see opposite). Some were red (presumably those branded as CASE). But they also do khaki for the Army, white roofed for airports, Dayglo orange for Belgium highway use, etc. They also do fancy metallic paint finishes for certain customers. And of course we heard about the silver and gold(?), limited editions for special anniversaries. Apparently 150 tractors (type 7810) were painted silver in 1989 to mark the plant's silver anniversary. At the time, some farmers did not like the colour and had them re-sprayed to blue. But it could be that they now rue their actions; blue 1989 tractors currently sell for around £13k, but silver ones go for £39k.



After the factory tour, we were let loose in the showroom (see opposite) where we were amazed at the biggest tractors worth up to a £250k and having wheels larger than a tall man, . Regrettably (but understandably) we were unable to start any engines or venture onto any test track. There was a simulator but we were short of time unfortunately. We also failed to question them on their future plans with regard to autonomous tractor driving but we do not think electric tractors figure high in their future plans!

Many thanks to the team at New Holland, Mike for the transport for most of us, and to our colleagues from SREK.

Ivan Farrow & Mike Wooldridge

## SUBSCRIPTION REQUEST: (2018/2019)

Subscriptions are due from 1 October. Please return this form with your cheque made payable to RCEA for £ 15.00

To: Treasurer, A J Tomkins, 13 Milton House, Milton Road, Haywards Heath, RH16 1AG

Full name:..... Telephone No .....

Address..... e-mail.....

.....

I enclose a cheque made payable to RCEA for £..... (£15.00) Please return this form by  
1<sup>st</sup> October 2018 (**Separate cheque please from any other payments to RCEA**)

## REPLY SLIP – NATIONAL GRID (ENCC)

To: Perry Eastaugh, 33 Ruston Park, Rustington, Littlehampton, BN16 2AD  
(01903 788858) email: [perry.eastaugh@icloud.com](mailto:perry.eastaugh@icloud.com)

I would like to visit the ENCC on Tuesday 25<sup>th</sup> September 2018. Please place my name on the waiting list as I understand that the visit is currently fully booked (priority will be given to members):

Members ..... Guests .....

Full name .....

Address .....

.....

Telephone (mobile preferred): .....

Email address: .....

**Applications by Saturday 8th September 2018 please.**

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## REPLY SLIP CHRISTMAS LUNCH

**To: George Woollard 18 St Lawrence Ave, Worthing West Sussex BN14 7JF (01903 523640 or 07541224769)**

**E Mail : [Georgewoollard1@hotmail.co.uk](mailto:Georgewoollard1@hotmail.co.uk)**

Can you please reserve me ..... places for the Christmas Lunch at the Windsor Hotel, Worthing on **Wednesday 5<sup>th</sup> December 2018. 12.00 for 12.30.**

**Full name:**.....(Block capitals)

**Address**.....

.....

.....

Telephone Number.....Name of guest/s .....

E mail address.....

Car registration number for disabled parking .....

I enclose a cheque made payable to RCEA for **£.....(£29.00) per person**

**(Separate cheque for this event please)**

**Applications by Saturday 1st December 2018**

If possible, I would like to be seated with.....

### Menu choices

| Name 1 | Name 2 | Menu choice                      |
|--------|--------|----------------------------------|
|        |        | Spiced Red Lentil Soup           |
|        |        | Stuffed Mushrooms                |
|        |        | Smoked Seafood Pate              |
|        |        | Honeyed Ginger Chicken Skewer    |
|        |        | xxxxxxx                          |
|        |        | Turkey                           |
|        |        | Pork                             |
|        |        | Sweet Potato Nut Roast           |
|        |        | Salmon Fillet                    |
|        |        | xxxxxxx                          |
|        |        | Christmas Pudding                |
|        |        | Coconut Panna Cotta              |
|        |        | Chocolate and Black Cherry Torte |
|        |        | Trio of Cheese                   |