

FORTHCOMING EVENTS

July

Club Meeting: Wednesday 3rd July – **Mike Sayers' Trophy.**

Club Visit To Aine School (York): Wednesday 10th July.

Workshop Morning: Tuesday 16th July 10-12 noon.

Brian and May Stephenson's Garden Party Sunday 21st July 2-5pm

PEEMS Railway at the Ryedale Show: Tuesday 30th July.

August

Club Meeting: Wednesday 7th August - **'Bring and Buy' Auction**

Workshop Morning: Tuesday 20th August 10-12noon.

CLUB MEETING: Wednesday 5th June

• Introduction.

Whilst a few of our regular members were unable to attend the meeting for personal reasons, numbers were made up by guests and visitors who had a particular interest in Bridget Laycock's talk on the Marshall tractor. There was a good turnout. Chairman Colin Bainbridge welcomed everyone to the June meeting.

• Rolls Royce Heritage Trust Lectures.

The Rolls Royce Heritage Trust Lectures will be displayed at the meetings for the rest of the year. The list is reproduced on the next page.

• Doncaster Show

Colin thought that PEEMS put on an excellent display with many favourable comments from people visiting the stand. The centre-piece was Mike Sayers' scale model Bentley engines which commemorated the centenary of the Bentley motor car and also the 20 years Mike had devoted to the 1/3rd scale models of the 3 litre and the 4 1/2 litre 'Birkin' Blower engines.

Whilst the PEEMS stand did not win the *'Best In Show'* award (that went to the Grimsby and Cleethorpes club), Mike's 4 1/2 litre engine was entered into the Doncaster show exhibition competition itself, and gained for him a gold medal and the Barry Jordan *'Best In Show'* cup. His work was also judged as part of the wider model engineering competition. This is the national/international exhibition that the *'Model Engineer'* magazine is associated with. In this Mike won the *Bradbury-Winter* memorial cup. This is one of the highest engineering awards that can be awarded by the model engineering fraternity. On behalf of the whole of PEEMS, congratulations to Mike on an award that was very well deserved.

Colin wanted to give a special thanks to David Proctor and Mike Sayers for the preshow planning and their efforts in making everything run very smoothly. Thanks to all the people who assisted in one form or another. Jonathan Milner and John Nesom provided the vans for transporting both the models and the stands to and from the exhibition. That made things run very smoothly and PEEMS thanks them for that. Thanks to all those who helped set up and break down the stand, and of course the stewards who were a vital part in making the exhibition work. Also, a very big thanks to those who provided models for the exhibition stand.

• Welburn Hall School. Tuesday June 25th

Tony Leeming and Colin have visited Welburn Hall School, and whilst there has been a change of staff since our last visit, Colin is pleased to say that what the school wants is exactly what we have done in the past. This means there will be no change. PEEMS will turn up with the portable track, loco and rolling stock, and there will also be two traction engines to entertain the children.

The intention is that the arrival time will be 8am to set up, with operations starting between 9.00 and 9.30am. The whole day is a rewarding experience and Colin hoped for many volunteers.

- **Alne School (York). Wednesday July 10th**

The Alne school event is an educational 'fun day' which is similar to the Amotherby School 'Science Event' held last year. This event does need a minimum turnout of 8 members to cover everything, and currently the number of people who have offered to help is on the minimum limit. Colin does need to know that the numbers are as required by the next meeting. The current numbers do include one member whose attendance is dependent on personal circumstances

- **Brian and May Stephenson's Garden Party on Sunday July 21st ~ 2.00 to 5.00pm**

There will be a garden party, with refreshments at 86 Holbeck Hill Scarborough. All Welcome. £5.00 per person with all proceeds going to Cancer Research.

RSVP with numbers to: Mayqs80@gmail.com or tel 01723 354415 or 86 Holbeck Hill Scarborough YO11 3BW

- **Ryedale Show. Tuesday July 30th**

There is a need to know at the next club meeting, if there are enough volunteers to take the railway to the Ryedale show. There needs to be an absolute minimum of 3 to 4 people. Colin will seek volunteers at the next meeting.

- **Club Workshop.**

Just a reminder that the club workshop is available for anyone who needs to use it for continuing or starting a project. Access is either by George Gibbs or John Powell.

- **Club Coach Outing.**

There was talk earlier in the year about a club outing. The suggested date at that time was September when the schools go back. The suggested venues were:

- Manchester Science Museum
- Bolton Steam Museum
- Anson Engine Museum (Stockport Manchester)

A decision will have to be made if the club wants an 'away-day' outing, so that a party booking can be made and a coach hired.

The issue for Colin is that he would like everyone to have an input into where they would like to go. Colin would like an e-mail to go out to everyone so that people could give their opinions on what would be the best venue. The most popular venue would be reported back at the next meeting. The consensus on the evening was that members would like an outing. All the above museums are free entry (with voluntary donations), and the coach will be around £20-£25 a head. PEEMS will try and keep transport costs within those bounds.

- **Twin Fluorescent Tubes.** There are over nine 6-foot twin fluorescent tubes available from Alistair McLeod. Telephone: 07729064318.

ROLLS ROYCE Lectures At Derby 2019

For all Derby lectures:

Start: 17:15 hours
Location: Derby
Address: LDC, Wilmore Road, DE24 9BD

- 18th September: **Ray Dorey Memorial Lecture: *ACCEL – Accelerating the Electrification of Flight.***
Mattheu Parr ACCEL Programme Manager
- 23rd October: **Roy Heathcote Memorial Lecture*: *Folland Gnat Display Team.***
Oliver Wheeldon Pilot Gnat Display Team.
- 6th November: **End of Year Lecture* *Rolls Royce - Flying Test Bed.***
Captn. Mark T Lewis, Rolls Royce Chief Test Pilot

**These lectures are subject to change; please check the heritage trust website for updates.*

For a full range of Rolls Royce Lectures, and online booking, the website is:

<https://www.rolls-royce.com/about/heritage-trust/heritage-trust-events.aspx>

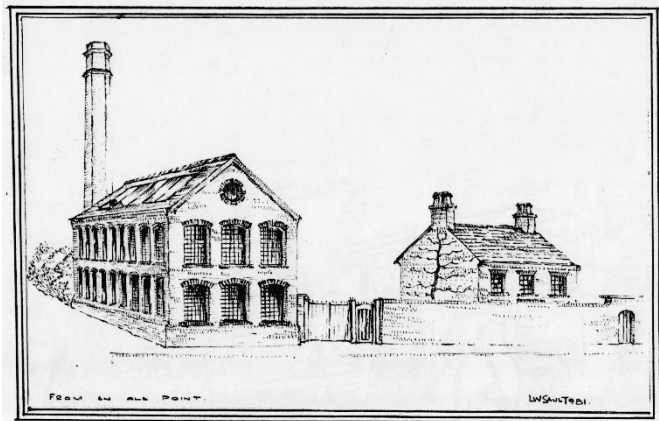
Bridget Laycock. A Talk and Slide Show on the Marshall Tractor.

PEEMS welcomed Bridget to the club meeting. Bridget is the representative of *The Marshall Club*:
<http://www.themarshallclub.com/> (when clicking on the link click on top left back arrow to return to the newsletter)

Some History:

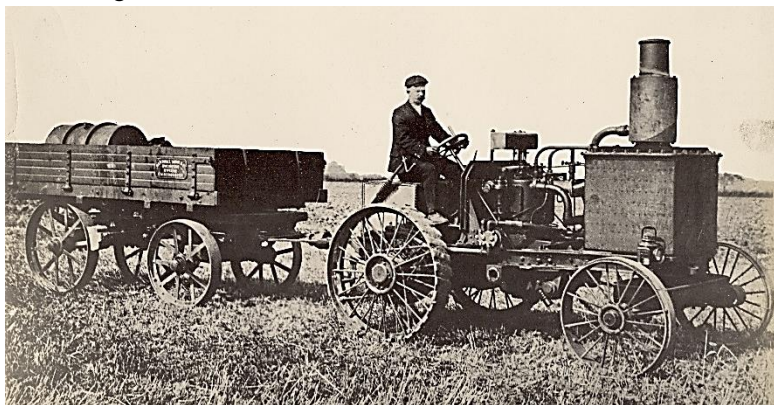
William Marshall, set up his business in Gainsborough Lincolnshire in 1848. Last year *The Marshall Club* celebrated 170 years of the name and mounted a couple of marvellous events (of which more later).

The first photo shows the Smithy in Beaumont Street, the first building erected on the site of the "*Britannia Iron Works*". The next photo shows a single storey office building, with the '*Britannia*' statue above. The statue still exists above the door, even though the site is now occupied by a shopping centre. A second storey was added to the office building in Edwardian times.



To begin with, William Marshall traded as a general blacksmith and then when his sons joined the company, they manufactured portable engines, saw benches, 'thrashing' machines, and other agricultural implements. Although they produced steam traction engines, it was not until around 1906, that they were involved with internal combustion (i/c) tractors.

Below left is a photo of the first prototype two-cylinder tractor and on the right the production version of it seen here 'thrashing':



The four cylinder 60 hp 'Oil Tractor' is shown on the left.

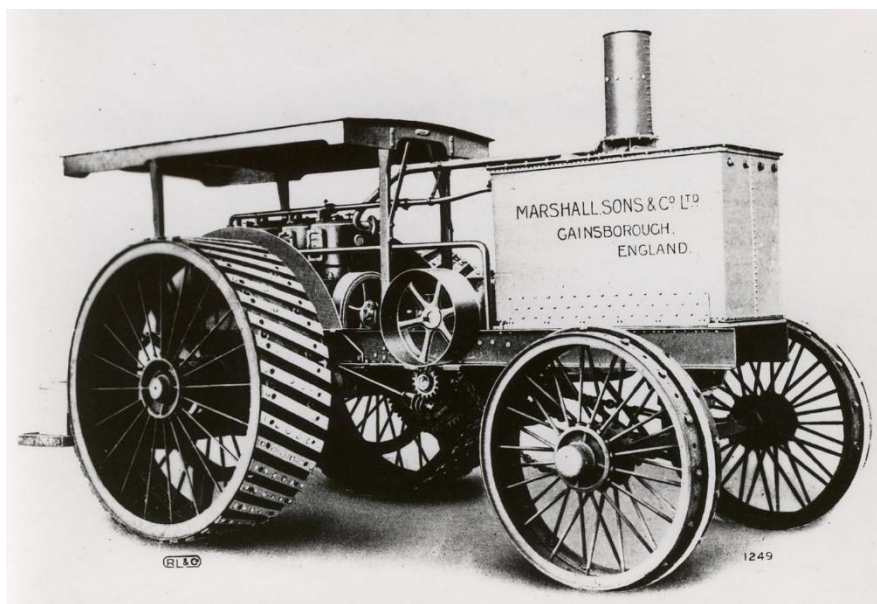
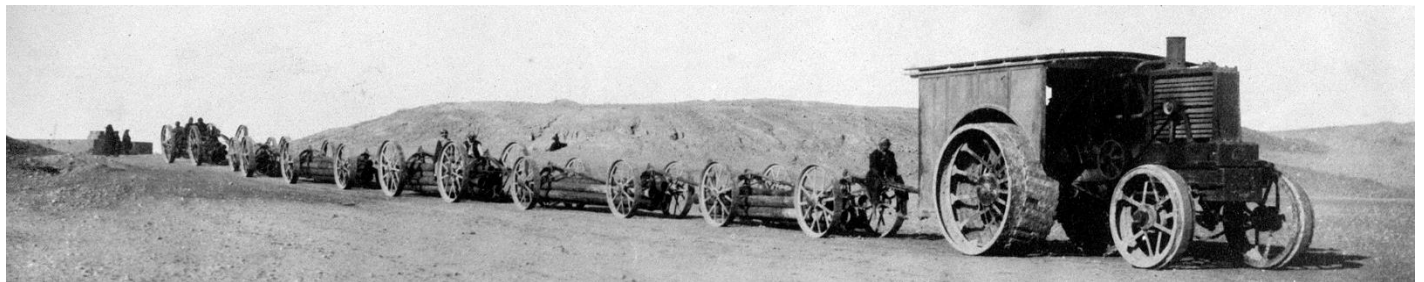
Mr Bamber was a friend of William Marshall's grandson Herman and he was asked to design both the two and four cylinder tractors.

At least one was built and Bridget would love to find it.

By 1908 Marshalls knew that steam was in decline and decided to put various versions of their i/c tractors into production. They became known as 'Colonial' tractors because they were specifically designed for the open plains of the colonies. There were two and four cylinder engine variations and some still exist in Canada and Australia. One was brought back from America 15 years ago and it made a lot of money in a recent sale. These photos were taken at Pilham just outside Gainsborough.



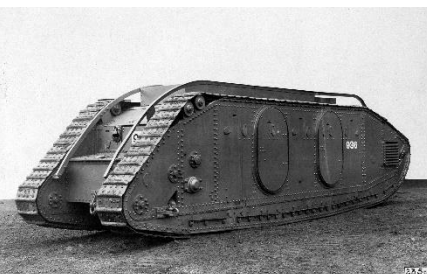
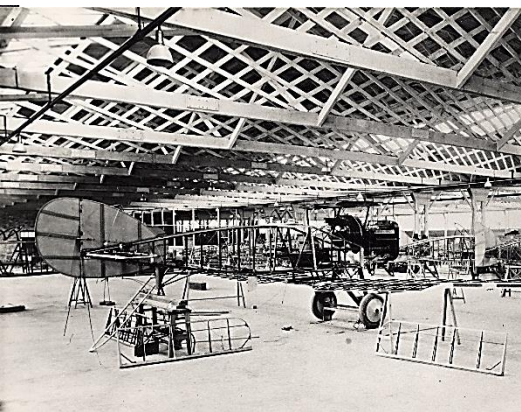
The tractors were also exported to the Middle East where they were used with six or eight trailers for hauling pipes for the oil industry in Sudan. The enclosed canopy on the tractor gave shelter from the sun.



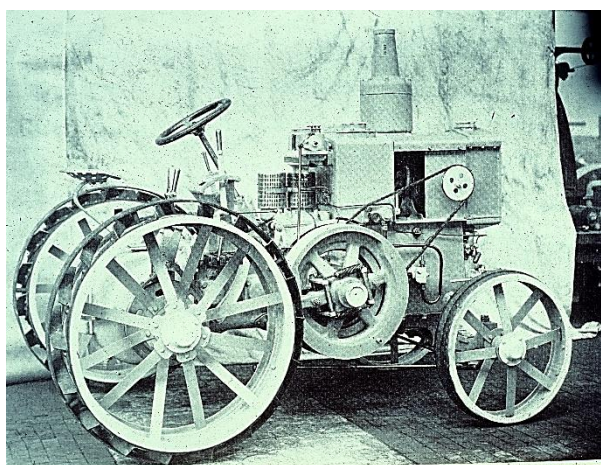
Here is a drawing of a 'Colonial' with a large water tank at the front and a four-cylinder engine.

These were incredible machines.

During the First World War, all the engineering firms, went over to manufacturing munitions, and Marshalls manufactured munitions, aircraft and unarmed personnel tanks etc.



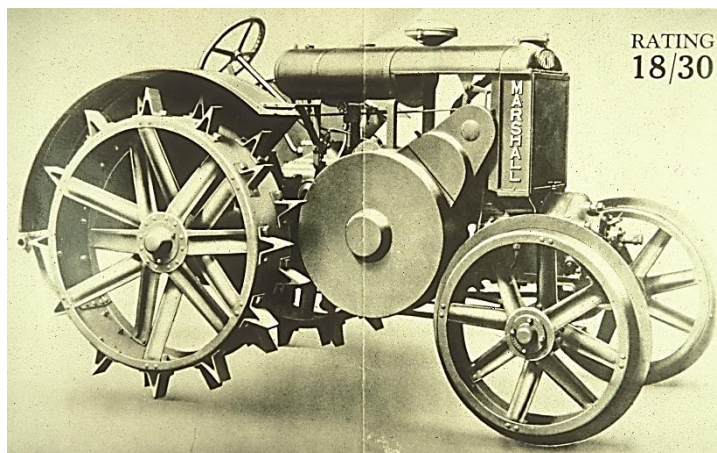
After the war, Marshalls decided not to continue with i/c tractor production but to continue manufacturing steam engines which they built through to the end of the 1940s. In 1928/29, the prototype tractor shown below was designed in-house and the single cylinder Marshall tractor as we know it today began to evolve. On the right is the prototype being shown in 1929 at an open day organised by Marshalls.



The photo below shows the second prototype with a Marshall's 'trashing machine' on some wasteland near the 'Britannia Works'. The second photo shows another 'trashing machine' with a 15/30 tractor which was introduced in 1930. The 15/30 was not very successful, and a lot of them were taken back into the works and redesigned. The 15/30 had a big single cylinder engine. Bridget had been told that a couple of the Marshall family are seen at the top of the photo. The bottom two photos also show 15/30s.



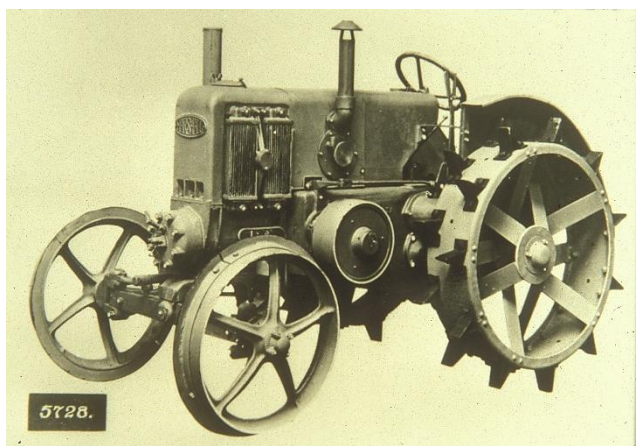
The 15/30 was then uprated to the 18/30. There is one 15/30 in preservation and several 18/30s. In fact, in April an 18/30 was sold to a friend of Bridget's. Marshalls produced a lot of 18/30 tractors and here we see a car type production line with people working on various stages of the build.



The next photo shows a 15/30 and the track for the self-built steam railway that operated on site to move components and equipment around. Tractors were also used for the same purpose, and the next photo shows a 15/30 passing boilers which had been left out for several months so that rust would seal any small holes not secured by the rivets. The site was enormous covering about 28 acres.



After the 18/30, Marshalls developed a smaller tractor the 10/20, shown below, which wasn't a success, and it was quickly developed into the 12/20. The second photo shows a 12/20 towing a binder at Pilham where the Marshall family lived. The third photo shows a 12/20 Marshall tractor with two trailers of sheaves.



Besides towing and being used 'on the belt', the tractors were used for ploughing. Here is a preproduction Model 'M'.

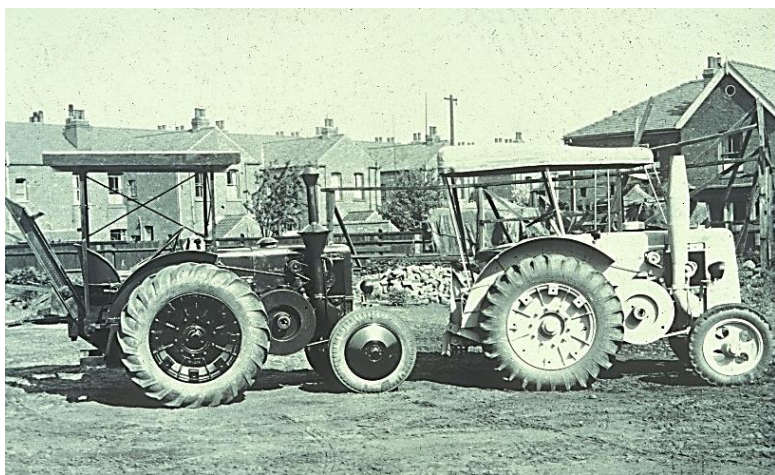
The land at the bottom of the 'The Cliff' escarpment in Lincolnshire, around Pilham and Corringham (which are between 'The Cliff' and Gainsborough), is very good land.

The photo below shows the early Model 'M' which was developed from the 12/20. Bridget and her husband Robert have a canopy on theirs which Robert produced based on the photo, but made it 3" lower so that the 'Marshallitis' goes over the top. The Marshall engine has a 'total-loss' oiling system and the oil spill should be directed over the top of the canopy, otherwise you can get a black face and everyone tells you "you have *Marshall's Measles*". The second photo shows a power unit based on the Model 'M', which was called the T/20. This is a single cylinder stationary engine which has no wheels and is bolted down. The T/20 in the photo is in South Wales, and there are not that many left.



During the Second World War, production once again turned to supporting the war effort, and Marshalls were involved in manufacturing mini-submarines, of which several were produced.

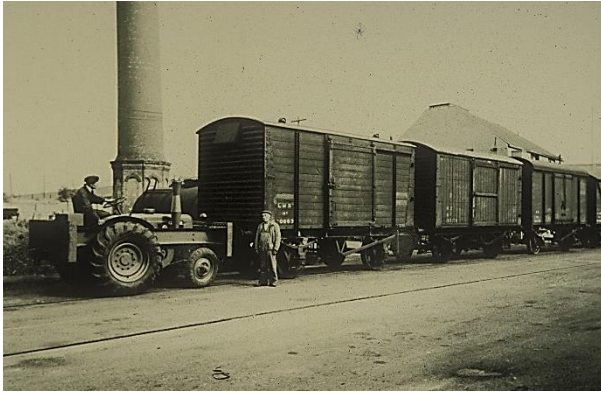
During the War, Marshalls still manufactured some Model 'M's and also designed and developed the first Field Marshall, the Mark 1. The photo below shows a Model 'M' on the left and a Mark 1 on the right. At this point the 'Field-Marshall' was born. The second photo shows the prototype 'Field-Marshall' in the works. The difference in the exhausts can be seen in both photos.



The Series 2 followed the Mark 1 and the photo below shows a Series 2 towing the 626 Combine. Marshalls made a number of Combines but were persuaded by Massey Harrison and others to leave the Combine market. There is still a 626 near Lincoln, which is worked occasionally. The second photo shows a Series 2 full "Contractors Model" with lights, towing a 'thrashing' machine and a baler.

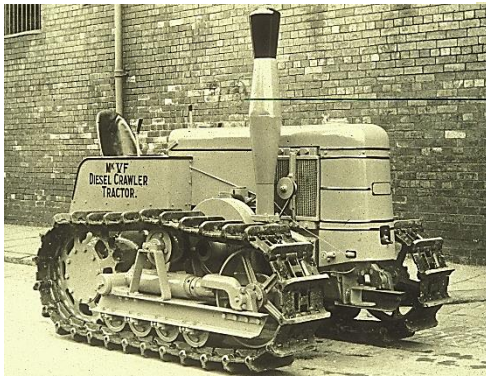


Marshall's made two Field Marshall 'shunters' for use in the goods yards in Gainsborough. The second photo shows a Series 2 in India. The Series 2 was exported world-wide.



Whilst the Series 2 was being developed, Marshall and Fowlers were also developing a caterpillar tracked version. Fowlers took the Marshall engine and mounted it on their tracks, and so the VF was born.

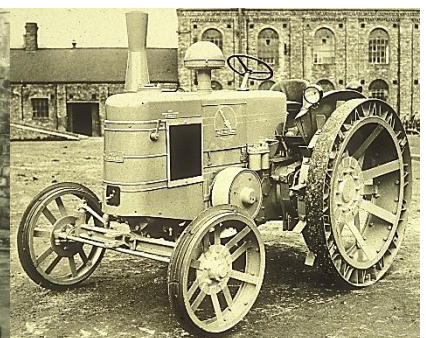
Photo 2 shows one ploughing and photo 3 has a VF with a Bray bulldozer blade working in Loch Ness.



The next tractor to be developed was the Series 3. It had slightly different bodywork, bigger wheels and a bigger engine. A lot were exported to Canada and some were sent back for improvement and this developed into the 3A. The second photo shows the prototype 3A. The flywheel and the engine were more or less the same size as the Series 3 with a 6" bore single cylinder.

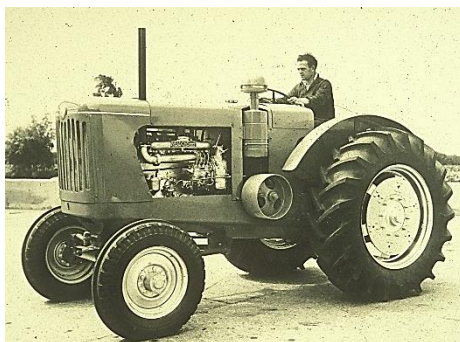
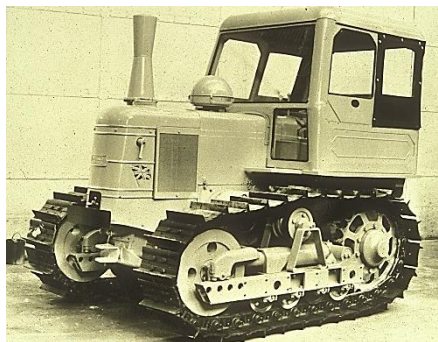


The photo below shows a winch on a Contractor's tractor. The second photo shows one packed up ready to go to the colonies. All the tractor testing was carried out at *Trent Works*, which was originally bought to build 'thrashing' machines etc. The third photo shows a 3A on steel wheels at *Trent Works*.

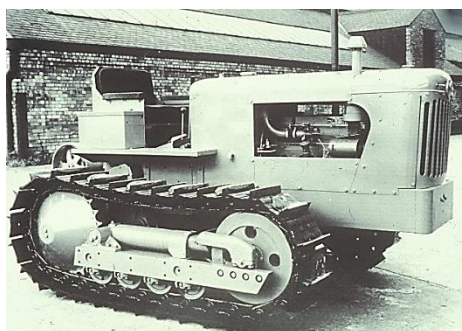


The following photograph shows the VFA caterpillar tractor which was developed from the 3A. With regard to wheeled tractors, Marshalls decided that the future lay with multi-cylindere engines and built two four-cylinder engined MP4s (second photo).

The MP6 (photo 3) was created when Marshalls decided to go with a larger Leyland six-cylinder engine.



In 1955 the "Track- Marshall" made its first appearance at *The Royal Show* and was the last tractor the firm built, with the final delivery in 1997.



Present Day and Preservation:

Bridget got involved with Marshall tractors a long time ago when her uncle, who was a contractor, had one. The reason he had one was because he knew the Tate family who owned a Model 'M', which was used for 'thrashing' and belt work. Bridget's uncle was so impressed by the Model 'M', that he got a Field Marshall Mark 1 himself, but unfortunately his work as a contractor was mainly ploughing, and the Mark 1 didn't do well at that, so it was taken to pieces and stored. The Tate family's Model 'M' tractor had always been hidden away and Bridget had never seen it until she took the two photos below. A few years later she was invited to see it rebuilt and restored in Northamptonshire.

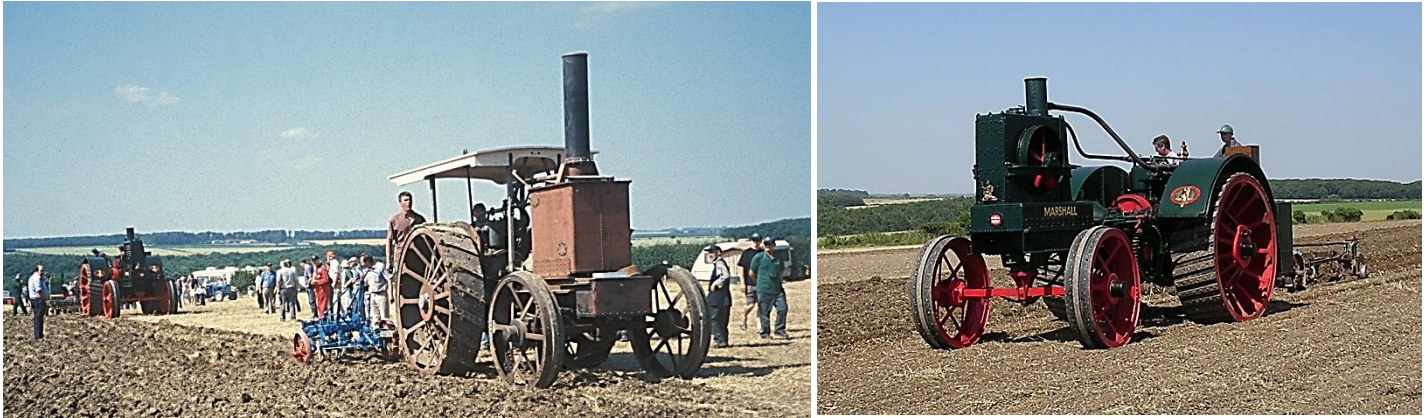


Here is Bridget and Robert's Model 'M' being used on a Marshall's 'saw bench' in her garden. It has the canopy on and a tool box. This tractor, as mentioned earlier, has a single cylinder engine with a 6½" bore x 9" stroke, and a 'total loss' oil system.



Preservation:

The first photo below shows the two 'Colonial' tractors that were in this country. In the 1990s, Henry, the last surviving Marshall, who still used to go into the works, was told about the big four-cylinder 'Colonial' tractor (the rear tractor in photo 1), which was in a scrapyard in Australia. On behalf of Marshalls he brought it back to this country to be restored and it was displayed in the Marshall museum. When the Marshall museum was closed, Mr Crawford of *Crawford and Sons*, a Marshall agency since the early 1930s, bought all the tractors in the museum. *Crawfords* are now being run by the third generation and Robert Crawford Junior has just taken over in the last couple of years. The tractor in front was brought back by John Stephenson and 10 years ago it was sold to the Ward brothers who have a collection of tractors in the Ripon area which they display at shows. In 2019 it was exported back to America, and made a lot of money at auction. The only time these two tractors ploughed together was on this day in 2003 at Goodmanham Wold. The second photo shows the *Crawford* tractor ploughing.



The two-cylinder 1909 'Colonial' tractor is on the right in the first photo below, and the 1924 7 hp steam engine is on the left. The second photo shows the only 15/30 'in captivity' and it belongs to the Crawford family. The third photo shows three 18/30s at the Welland show. One was dug up from a farmyard in France, where it was completely buried. The owner has made a lot of parts himself, but he did have help. However, this was a feat of engineering.



Here is a nicely restored 18/30 and another 'earning its keep' in South Wales.



The first photo below is Bridget and Robert's tractor at Newark 2000 with the 'Colonial' in the background. The second photo shows a Mark 1 ploughing on the Wolds at a 'fun weekend' and it is also used for 'road runs'. In the third photo the dog was 'wandering loose', but as soon as the run started she was sitting on the tool box. Her name was 'Diesel'!



The first photo is a Series 1 second generation coming out of Marshall's yard where there is a tractor gathering every year on 'Father's Day'. This tractor is very well used (but making too much smoke). Marshalls also produced diesel 'Road Rollers' (photo 2) and in photo 3 is a restored Fowler 40 B.H.P diesel locomotive for haulage. It is a standard Field Marshall engine mounted on rail running gear ~ very noisy!!



Below is a Series 2 coming out of Gainsborough last year, a VF being worked hard and a Series 3 towing a 626 Combine, which is being worked properly.



Below is a Series 3A in 'Fowler orange', and the very last Marshall to leave Marshall's yard in 1997 was a Track-Marshall.



Finally, a photo to show the development of Marshall tractors from the 1909 'Colonial' on the left and showing the 18/30, 12/20, Series 1, 2, 3, 3A and MP6



Following tea and biscuits there was a Question and Answer session:

Q What happened to the machine shops at Marshalls?

Bridget: All the machine shop tools were sold in a big sale in 1989.

Q Was there an attempt to turn the Marshall site into a Heritage Centre?

Bridget: There was a Heritage Centre in two rooms of the Marshall offices. When the Marshall site was sold to be developed, the Heritage Centre had to close but it has now moved to the 'Old Post Office' a bit further along.

Q Are the Marshall tractors unique in only having a single cylinder?

Bridget: No. Other countries have produced single cylinder tractors as well.

Q Were the single cylinder engines difficult to start in service?

Bridget: The starting procedure involves using a starting paper, which is blotting paper soaked in saltpetre. Commercial starting paper contains saltpetre and other ingredients. The fly wheel is set to half compression. The engine can then be started by the handle or by using a cartridge hit by a hammer.

Edit: This starting procedure for a Marshalls tractor is shown in the following video:
<https://www.youtube.com/watch?v=VEurohAwrmA> (hit top left back arrow on video to return to newsletter).

Q Is it harder to start on a cold frosty morning?

Bridget: Using a starting cartridge in those conditions, the engine will start OK. They are difficult to start in the cold with just the handle and starting paper.

Q Gainsborough doesn't strike me as being an industrial area.

Bridget: Lincolnshire traditionally has had various companies which built agricultural and steam engines. Gainsborough also had a factory which made wrapping paper for chocolates. There is also *Edlington Graders* which made agricultural machines. Gainsborough was a notable port on the Trent at one time.

Q Were all Marshall tractors built at Gainsborough?

Bridget: All Marshall tractors were built at the *Britannia Works* and tested at the *Trent Works* at the side of the river Trent. The aircraft (150 Bristol F2B 2-seater bi-planes ref: Wikipedia) were built at the *Carr House Works* during the First World War.

- Q** Is there an authoritative history of the Marshall Company?
- Bridget:** Yes. There is a book by Michael Lane: 'A History Of The Britannia Iron Works'. Peter Anderson has also written two books:
- *Three Decades Of Marshall Tractors (1997)*
 - *Marshall Diesel Tractors 1930-1957*
- Q** Do you think that Marshall tractors were as successful in the UK as other makes of tractors, as many were exported?
- Bridget:** Yes, they were successful in UK as well.
- Q** Are the tractors two stroke or four stroke, or diesel or petrol?
- Bridget:** They are diesel and two stroke.
- Q** Was the 'total-loss' oiling system used to the end of the working life of the tractors?
- Bridget:** To the end of the single cylinder engines. Traditionally there is a little bucket underneath the tractor.

PEEMS would like to thank Bridget for taking time out to give us a very informative and interesting talk

The photographs reproduced in this article are copyrighted to The Marshall Club, and kind permission to use them has been granted by Bridget Laycock representing the Club. Thanks also to Ian Palmer for proof reading and sending corrections.

Progress On Ivan Shaw's Personal Aircraft 'The Merlin'

As reported in the last newsletter, Ivan has now had the electrics and avionics installed, and the engine has been started. An electric fan is being installed in the engine bay for cooling. Progress on the aircraft is increasing with the next stage being surface coating in yellow for conspicuity.

The photos below show the *Garmin* avionic display in the cockpit, with SAT NAV, and system information.



PEEMS Visit To North Sea Winches and Unison (Pipe Bending Machines) in Scarborough 13th June.

Fifteen Members had a very interesting visit to the Eastfield Industrial Estate in Scarborough. This trip was enlightening for the fact it illustrated that engineering innovation in the UK is still present, and if what we saw was multiplied over all the industrial estates in the UK, engineering is still a powerful presence in our economy.

The two main companies we visited were *North Sea Winches* which supply both the shipping and oil and gas industries, and *Unison* who build high tech pipe bending machines for world-wide use. In between, we visited the *UAD* machine shop. *UAD* manufacture components for customers and also provide engineering solutions and support to industry. <http://www.uadengineering.co.uk/>.

PEEMS thanks Ted Fletcher and Brian Stephenson who organised the trips to all three facilities and to the welcome Fish and Chips meal and cup of tea at *PAPAs* restaurant.

- **North Sea Winches (NSW).** <https://nswinches.co.uk/>



Robert Gretton gave us a potted history of NSW. North Sea Winches started as a general engineering company by Robert's grandfather in the 1960s. In the late 1960s Robert's father (Richard) started working with his father. From the early 1970s North Sea Winches was born. Primarily NSW provided specialised engineering services such as trawler winches, hydraulic presses and systems. That continued through the 1970s to the 1980s. Fishing was the main customer at that time, and NSW provided deck packages, and hydraulic systems. That went on for a further ten years until the fishing industry collapsed. New markets had to be found, so the company moved into providing for tugs, marine and civil engineering, and anywhere people needed winches. That continued to the mid-2000s (2005-2010). The marine industry at that time was a bit turbulent with good and bad years. NSW hadn't been involved in the offshore oil/gas industry at this point. Ten years on, in spite of a downturn in the oil/gas industry, NSW are heavily involved in this industry and its support industries. NSW are also still involved in the marine industry.

Everything is done in-house at NSW. There is a sales team, a design team, a project team, quality management and health and safety. There is a machine shop (turning, milling, boring, gear cutting), and facilities for fabrication, assembly, testing and painting. It is basically a "one stop shop". There is a little subcontracting out, such as large vehicle gear teeth. Some big fabrications are also subcontracted out. NSW pride themselves on their ability to process a job from initial tender through to delivery.

Robert then gave us a slide show of some of their previous projects to show their range and variety.

- **Slipway Winch (Mid 2000s Malta)**

At the end of the winch is a big trolley on which the boat is hauled up and down the slipway. The little winch on the right is called a 'down haul' winch. Once the boat is up the slipway, there is a lot of weight to shift. The little winch gives it the inertia to move.



- **Winch In A Shipping Container.**



This is a 15 tonnes winch that went to Sweden. This was supplied to the Swedish Polar Exploration Society. They requisition an ice breaking tug each year for a three-month scientific exploration. There is 6000 metres of cable on the winch, and at the end is a subsea core sampling device. This is launched into the sea bed to a depth of 3 metres. The core sample is analysed on the vessel.

- **50 Tonnes Mooring Winches.**

These winches go on an accommodation barge (see next page) which is positioned off Africa's Ivory Coast. There is a big anchor at the end of the winches. These winches take up the slack on the mooring line. They effectively "put the brakes on". The vessel is contracted to stay on station for three years. The accommodation barge is used to support off shore oil and gas exploration. Because of recent rig disasters, there is a mandate that too many people can't be on a rig at any one time. They have to work in shifts on the rig and are accommodated on the barge. The winches are all built in-house. They are electrically driven* through a spur helical gear box. This is NSW's own design and manufacture.



If a reeving system is put on a 50 tonnes winch, it is still rated at 50 tonnes.

***Note:** NSW are going away from the traditional hydraulic systems to the more convenient and more maintenance free electrical systems.



- **50 Tonnes Anchor Handling Winch.**

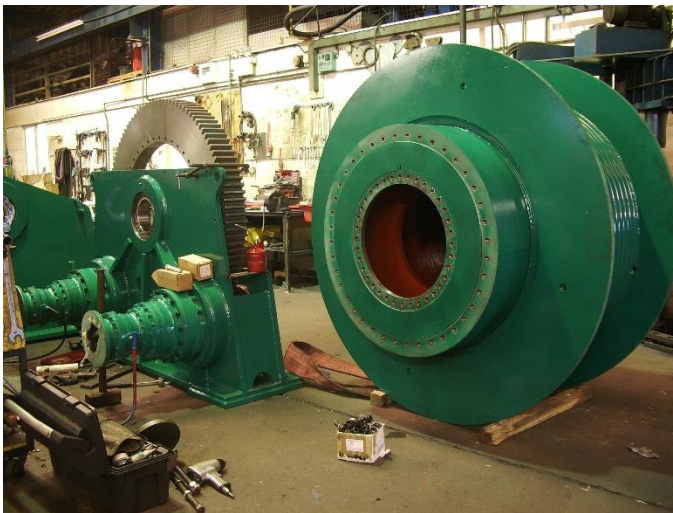


This is mounted on a tug. The 50 tonnes rating is based on the torque applied through the outer diameter of the cable. On core, the rating is 80 tonnes. This winch is for towing duties and anchor handling.

For example, on the accommodation barge above, the anchors are on the seabed, and a winch like this would retrieve those anchors. There is a buoy attached to the anchor on a length of wire. The tug hauls the anchors onto deck and they are redeployed when they are moving the accommodation barge. There are two anchors at the front of the barge and two at the back with eight mooring lines in total.

A few anchor handling winches have been manufactured over the years. This job was done for *Holyhead Towing* in Anglesey.

- **Crane Winch.**



This was manufactured before NSW had the new fabrication shop on site. This photo shows the assembly of a crane winch. There are two epicyclic gear boxes. There are also big output pinions. The ring gear is bolted to the drum. It is direct drive "power in power out". These winches are rated at 40 tonnes. They went on a crane barge for a Dutch company who are involved with industrial size automatic lock gates.

- **Twin Drum Tug Gear.**



Instead of having one drum doing two jobs, here each drum does its own job. One drum is for towing and the other drum for anchor handling. This is what is known as a 'waterfall configuration'.

- **Capstans.**



NSW also manufacture Capstans. These are 5 tonne rated dockside capstans. The messenger line is thrown dockside from the vessel. This is wrapped around the bollard at the top of the capstan. Pushing the foot switch causes the messenger line to be pulled in along with the main mooring line to which it is attached. Once the main line is pulled in, it is attached to a dockside chock and the vessels winches pull it in.

- **Anchor Winches.**



Rules and regulations determine that anchor winches need to be onboard for safety reasons. They are covered by regulations such as Lloyds Register, Germanischer Lloyds and DNV etc. The regulations determine the size of chain required for a vessel, sea state and location. Everything NSW does is bespoke, and a lot of information is required from a customer to make sure that what is delivered complies with the regulations. NSW want to “get it right first time”.

- **Control Systems.**

NSW have always supplied electric winches. In the last five years they have been using variable frequency drives (VFD). These control the frequency to the electric motor drive. For 50 Hz the VFD will split the 50 Hz into a number of ‘parcels’ which then determine how fast the motor will run. 50 Hz can be exceeded as well. 100Hz can be achieved, which will overspeed the motor, but the overspeed is limited by the internal balancing of the motor. The faster the motor goes, the less torque provided. Once past and electric motor’s nominal speed, the torque will drop off. NSW made the decision to build VFDs in house as it was better cost wise.

- **Some interesting High-Tech NSW Products.**

Active Heave Control (AHC) Winches.

North Sea Winches design and manufacture a range of AHC winches for subsea deployment duties. Driven directly by one or multiple hydraulic or electric motors the winches are specifically designed for load handling situations in an unstable environment. These winches compensate for motion in sea states with wave heights up to 6 metres. AHC winches can be integrated into A-Frame assemblies for even greater control of operations.

Constant Tension Winches

Many hydraulic winches can be supplied with a constant tension facility to provide safe operation where loads may exceed a given criteria. An external relief valve is set to provide a pre-determined load. The winch will stall if the load is increased and will even pay-out if the load increases even more. When the load reduces to below the relief valve setting the winch will continue to haul. Modern advances with electric motors running with inverter or frequency drives are now being used as constant tension winches.

The previous photographs reproduced in this article are copyrighted to North Sea Winches, and kind permission to use them has been granted by Robert Gretton. A special thanks to Robert Gretton for taking time out to give a very informative slide show and an interesting factory visit.

- **The Manufacturing Shop.**



There was then a tour of the Manufacturing Shop. In this area were machines for turning, milling, boring, and gear cutting. There are small and medium CNC machines.

In the shop there was project work for *Subsea Oceanographic*. This is a winch for carrying a string of sensors and is attached at the back of the vessel. The cable consists of 2000 metres of 12mm diameter Dyneema aramid with the string of sensors hanging off it.

- **The Main Assembly Shop.**

In the assembly shop we saw some winches for the mining industry, four large winches for *DMC Mining* and a smaller winch for the *Sirius Minerals* potash mine.



PEEMS Visit To 'Unison' Pipe Bending Machines.

After the visits to *NSW* and *UAD*, the next place visited was '*Unison*', who make pipe bending machines for world-wide use. '*Unison*' are also very involved with local schools and technical colleges.



We were met by engineer Dave Robinson, who gave us an excellent tour and readily answered all questions asked. The tour started with a video of Unison's activities. *Unison* are the world leaders in 'tube bending technology'. People in general don't know how many different markets and aspects of industry '*Unison*' get involved with, or the machines that they make. Quite often, people are surprised at the level of technology in the building. There are no other manufacturing sites, and everything seen in the video is done on the shop floor in Eastfield. There is another facility which is being set up in Danville Illinois, but that is more of a service portal for *Unison*'s US customers, rather than a manufacturing facility.

All the machines are designed around bending tubes, but '*Unison*' does get involved in projects such as robotic cells and robotic arms.

The bending machines are sometimes developed into much larger manufacturing cells rather than single machines doing the job. Instead of a person loading up the machines, they can be fully automated with robots loading the parts and taking the parts out, in a self-contained unit.

Pipe bending in a typical workshop involves using a hydraulic press rated at 20 tonnes. *Unison*'s machines are not hydraulic, but are powerful all-electric.



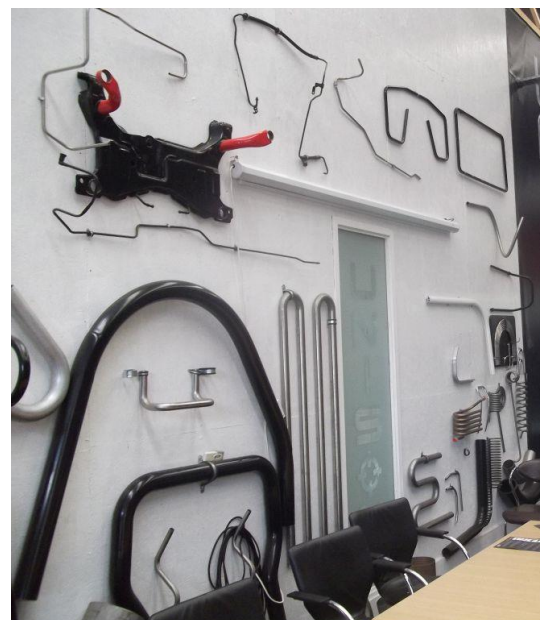
We were shown the largest piece of pipe that had been bent with an all-electric machine. It is 10 inches in diameter with a 10mm wall thickness. The tube has a one diameter bend radius. To bend the tube, there was an articulated mandrel on the inside and a circular former on the outside. The plant comes in, then there is a pressure die which is on the back of the pipe. There is a clamp on the bend arm. The pressure die pushed the pipe forward by friction as the clamp was pushed the pipe around. There had to be judgement to decide where the material was going. The speed of the process is essential, as there is a tendency for the material to wrinkle. Two of the largest electric motors available had to be used, joined with the maximum amount of gearing. It took around 90 minutes to bend the pipe, but it was a continual forming process, with the correct tooling, formers and experience. The process is still an 'art' and therefore it is being ironed out so it can be more repeatable.

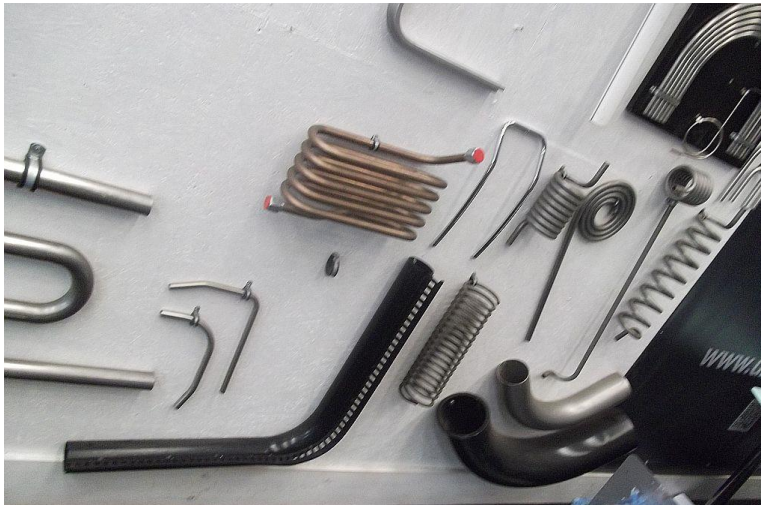
To form a thin walled tube with one diameter bend radius (the radius on centreline being equal to the diameter of the tube), the material is compressed on the inside and elongated on the outside with a resulting 50% reduction in cross section on the outside and doubling on the inside. For thin walled stainless steel, or anything brittle or not particularly ductile, the material may start to break up. Titanium pipes have to be formed very slowly.

Most of the tubes are 'cold formed'. There is a machine coming up in the next few months where the tooling has to be taken to 450°C. Some tubes may require annealing or stress relieving depending on the application. Because of the change in cross section of the pipe due to bending, some pipes for aircraft (such as the Airbus A380) are cut in half, the cross section measured and then the pipes are welded up again.

Unison work with some exotic materials. We were shown a Cunifer (copper **Cu** nickel **Ni** iron **Fe**) heating element. *Unison* has machines that can deal with thin walled pipes. There was a £500,000 machine in the factory which is going to Woolf Aircraft and can bend stainless steel pipe with a very thin wall. This is very difficult to do.

On the back wall were displayed bent tube for lawn mowers, wheel barrows, and chairs. On the automotive side there are brake lines (shown on the top), heating elements, and boilers where pipes are wound around the drum.





Unison are also providing bending machines for the oil and gas industry and are about to have one of their machines installed in Norfolk Naval Yard in the USA.

We then visited the shop floor.

The machines present varied in price from £60,000 to £80,000 up to £500,000. There was the *Woolf Aircraft* machine, which bends a 100mm diameter tube, and is capable of forming a one diameter bend radius. There is an ability on some of the machines to move up from one set of tooling to the next, so the customer can deal with a 200mm, 150mm, 100mm bend radius for example. Multiple radii can be bent at any one time.



We were shown a three-axis machine which allows a tube to be first bent one way and then the other. The more axes that are added, the more complicated the control and the greater the expense. The 3-axis machine is fairly typical. There are a great many safety features on the machine.



The next place visited was the machine shop where there were standard vertical milling machines and five-axis CNC machines. All machine parts are manufactured on site.

After visiting the machine shop, we visited the design office to see some simulation models of the machines on the screen.

PEEMS thanks Dave for an excellent and informative afternoon and to 'Unison' for accommodating our visit.

Here are some videos of *Unison* pipe bending machines in operation.

<https://www.youtube.com/watch?v=INt-m8JTLZM>

<https://www.youtube.com/watch?v=cJ6Df0fXDIs>

Some More News From Paul Windross.

Some further news on Graham Sykes' "*Force Of Nature*", a steam rocket [thrust] bike for speed record attempts: Graham has the machine on a test rig and it will be fired up soon. If it is OK it will be test run at the end of June. I will be seeing the rig test and will keep PEEMS up-to-date.

Today two old Alvis and various high-performance cars turned up. Yesterday the '*Eee-by Gumball Rally*' set off from *The Motorist Hub*. It seems that various vehicle clubs will be having rallies at this place.

<https://www.facebook.com/themotoristhub/>

***Bangers And Cash* ('Yesterday' Channel 19))**

Roger Taylor will be on the '*Bangers and Cash*' TV show at some time as his work place is involved to some extent.

Contact:

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