ICON

IVATT DIESEL
RE-CREATION SOCIETY

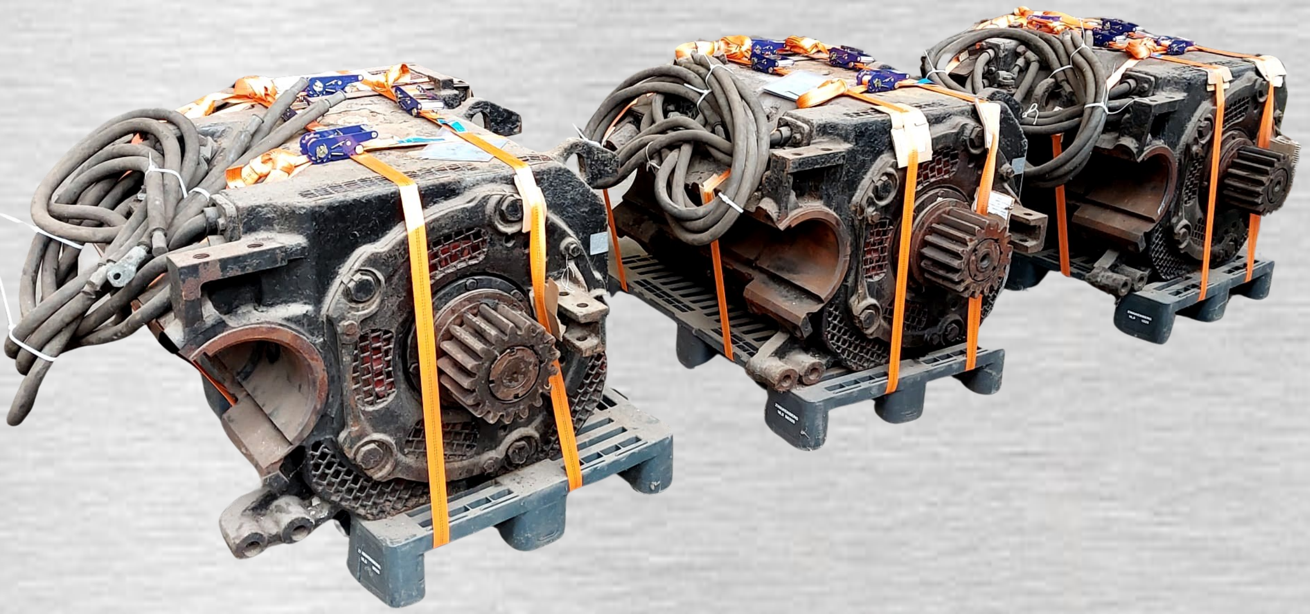
10000/1 at Willesden Junction, on the 13.35 Euston to Perth taken on 10 Nov 1956 — Terry Trainor Collection

Welcome to Issue 16 of ICON

SUCCESS!!!

In March we received the three ex-works EM2 traction motors and associated bogie spares. Acquisition of these parts has been a long and frustrating journey for us, much hampered by the bureaucratic necessities and extra costs associated with Brexit.

The first thing we have to say is a tremendous thank you to everyone who donated in the past toward the purchase of these parts. We also owe a huge thanks to the Werkgroep 1501 and their parent group, NS Rotterdam Staff Association (PV NSR). You can see our original report of Paul's visit to the Netherlands in ICON issue 5 (available in the Downloads section of our website LMS10000.com) Photos: Mark Langley



What is a traction motor ?

It is an electrical motor which receives power from the diesel power unit and provides that power to rotate the wheels. Our traction motors were built by Metropolitan Vickers in 1953, one on each axle of the bogies. With 17:64 reduction gearing. Each can provide 460hp. There's more technical description on page 7.

Status of each traction motor:

1 Dismantled for evaluation as the 'least good' to establish future working methods

2 Awaiting restoration and lessons learned from motor 1. It turns freely great resistance results after initial treatment.

3 As above.

4 In bogie 140, good insulation readings.

5 As above

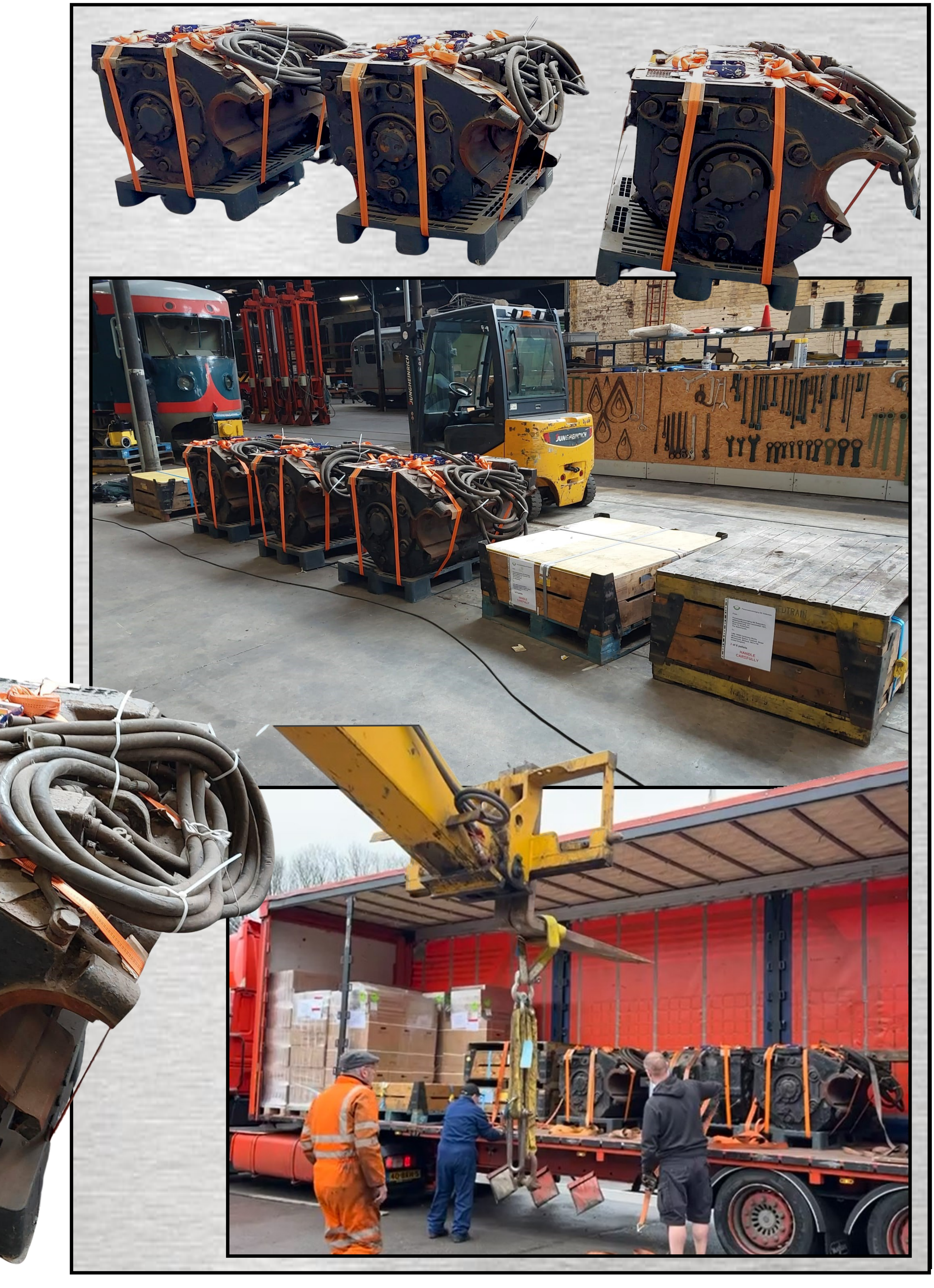
6 In bogie 140.

7 Arrived in the UK March 25, excellent insulation readings.

8 As above.

9 As above.

Photos: Top, Werkgroep 1501. Far bottom, Bernard Caddy.


JUNGHEINRICH
HANDLE CAREFULLY

The 3 boxes of bogie parts and 3 motors being brought into the workshop. This page, Mark Langley. Opposite page Bernard Caddy.


TELEPORTER
2
7·25

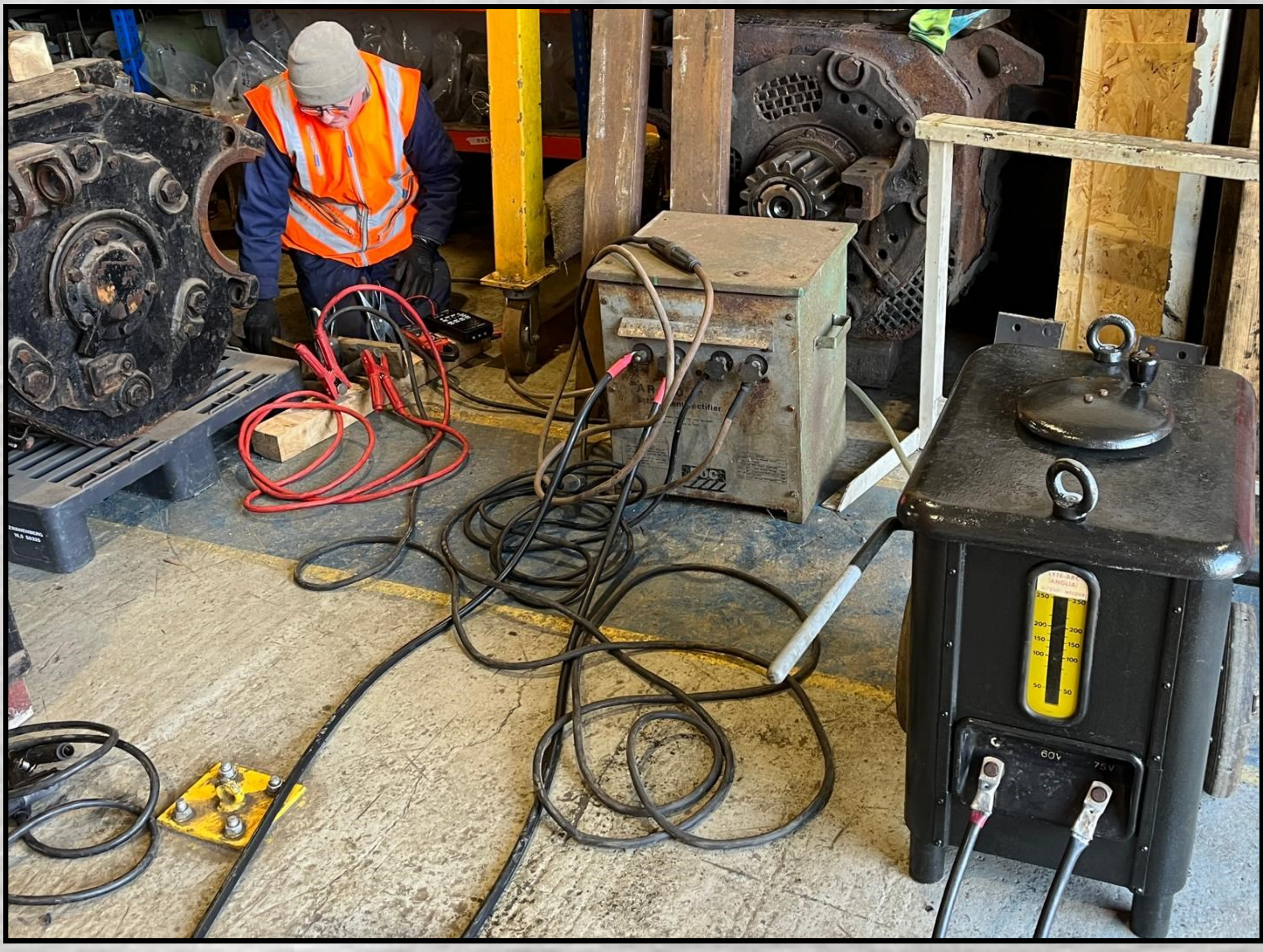

7·25


TELEPORTER
2
7·25
LMS10000

Graham reports:
The black and silver unit is the welding set. It's connected through a grubby grey rectifier to produce DC power, because the welder only regulates the AC mains supply to a lower AC voltage. The motor is a DC machine. Truly AC/DC and I was thunderstruck! The welder was turned down to absolute minimum volts. The motor started immediately and slowly accelerated to a balancing speed of about 400 rpm. The grease in the bearings was not in good condition, it turned out, although it looked reasonable. The motor was given a good grease with new grease by Paul, with a grease gun borrowed from the EVR, and after much faff to find and sort good grease nipples and the right fitting for the grease gun. Following this, the motor ran smoothly and hit a balancing speed of around 300 rpm at 25 volts and drawing 35 Amps. The ex Dutch motors have had so little running, probably only on a test bed, that the carbon brushes are not properly bedded in.

Paul adds:
And indeed I suspect that the armatures have a slight bit of shaft sag with being static for so long, so I would say that we need to run them all. I know that it sounds like nonsense but I have fitted fan impellers after being stood still for years, run them up (up to 40 tonne impellers) and they have shook with loads of coupling defection (up to.020 thou deflection) second run down to.002 thou and in perfect balance. From experience I would say that if we run that motor at @700 rpm from the start we would have been looking at 10 mm per second out of balance force. That's a no go. On our second run I reckon we were down to 4mm per second. It needs to be less than 2 mm per second and my synopsis is that is only achievable by rotation of armatures.

A video of the startup can be seen via this link. And this link *(members have a PDF copy emailed to them, from which these can be downloaded).*

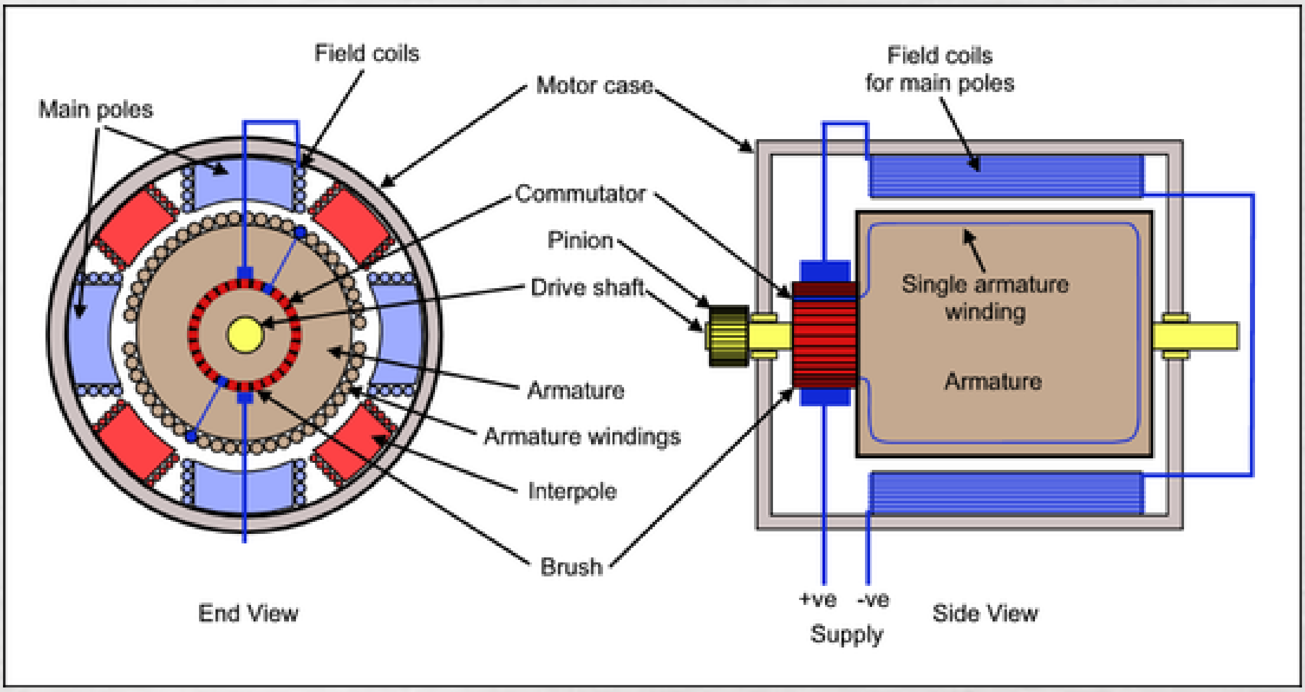


The DC Traction Motor

Dr Piers Connor, PRC Rail Consulting Ltd — http://www.railway-technical.com

Historically, the DC motor was the mainstay of electric traction drives on both electric and diesel-electric rolling stock. Many examples are still in use around the world. The motor consists of two parts, a rotating armature and a fixed field (Figure 1). The fixed field consists of tightly wound coils of wire fitted inside the motor case. The armature is another set of coils wound round a central shaft. It is connected to the field through "brushes" which are spring loaded contacts pressing against an extension of the armature called the commutator. The commutator collects all the terminations of the armature coils and distributes them in a circular pattern to allow the correct sequence of current flow.

Below, a schematic of the basic structure of a series wound DC traction motor showing the main parts and how the rotor (the armature) sits inside the field coils (the stator). The two parts are joined electrically through the commutator. The commutator rotates with the armature and provides the connection to the field coils through brushes. Diagram: Author.



The DC motor works because, simply put, when a current is passed through the motor circuit, there is a reaction between the current in the field and the current in the armature which causes the armature to turn. The armature and the field are connected in series and the whole motor is referred to as "series wound".

A series wound DC motor has a low resistance field and armature circuit. Because of this, when voltage is applied to it, the current is high (Ohms Law: current = voltage/resistance). The advantage of high current is that the magnetic fields inside the motor are strong, producing high torque (turning force), so it is ideal for starting a heavy object like a train. The disadvantage is that the current flowing into the motor has to be limited somehow, otherwise the supply could be overloaded and/or the motor and its cabling could be damaged. At best, the torque would exceed the adhesion and the driving wheels would slip. Traditionally, resistors were used to limit the initial current.

As the DC motor starts to turn, the interaction of the magnetic fields inside it causes it to generate a voltage internally. This "back voltage" opposes the applied voltage and the current that flows is governed by the difference between the two. So, as the motor speeds up, the internally generated voltage rises, the effective voltage falls, less current is forced through the motor and thus the torque falls. The motor naturally stops accelerating when the drag of the train matches the torque produced by the motors.

To continue accelerating the train, resistors are switched out in steps, each step increasing the effective voltage and thus the current and torque for a little bit longer until the motor catches up. This can be heard and felt in older DC trains as a series of clunks under the floor, each accompanied by a jerk of acceleration as the torque suddenly increases in response to the new surge of current. When no resistor is left in the circuit, the full line voltage is applied directly to the motor. The train's speed remains constant at the point where the torque of the motor, governed by the effective voltage, equals the drag - sometimes referred to as balancing speed. If the train starts to climb a grade, the speed reduces because drag is greater than torque. But the reduction in speed causes the back voltage to decline and thus the effective voltage rises - until the current forced through the motor produces enough torque to match the new drag.

AC and DC Motors

Both AC (Alternating Current) and DC motors have the same basic structure but there are differences and, for various reasons, the DC motor was originally the preferred form of motor for railway applications and most systems used it. Nowadays, modern power electronics has allowed the use of AC motors and, for most new equipment built today, the AC motor is the type used.

Often, people ask about the differences between AC and DC motors as used in locomotives and multiple-units. In the early days of electric traction at the beginning of this century both types were tried. The limits of the technology at the time favoured the DC motor. It provided the right torque characteristic for railway operation and was reasonably simple to control.

By the early 1980s, power electronics had progressed to the stage where the 3-phase AC motor had become a serious and more efficient alternative to the DC motor because:

1. They are simpler to construct, they require no mechanical contacts to work (such as brushes) and they are lighter than DC motors for equivalent power.

2. Modern electronics allow AC motors to be controlled effectively to improve both adhesion and traction.

3. AC motors can be microprocessor controlled to a fine degree and can regenerate current down to almost a stop whereas DC regeneration fades quickly at low speeds.

4. They are more robust and easier to maintain than DC motors. This type of motor is commonly called the Asynchronous Motor and was often referred to as the squirrel cage motor on account of its early design form. Both AC and DC motors are similar to look at externally but there are differences in construction, particularly because the DC motor has a commutator and brushes which the AC motor does not.

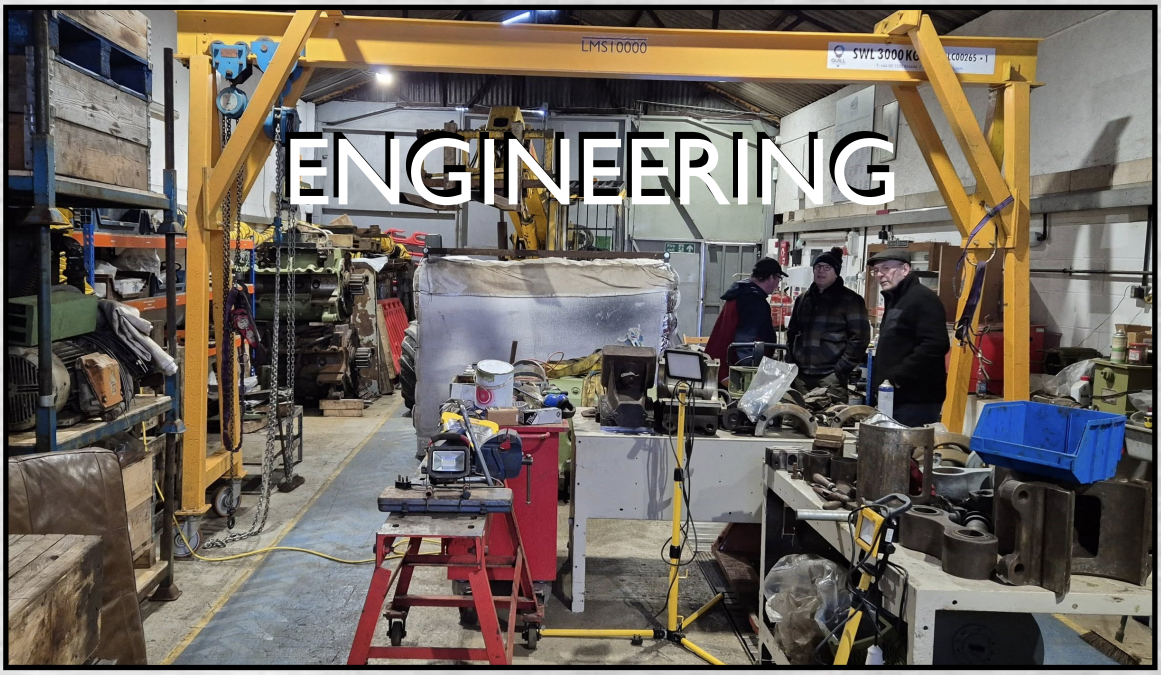
Top & Middle Left: Newly arrived motor under test, Andrew Hoseason, Anthony Pilkington.

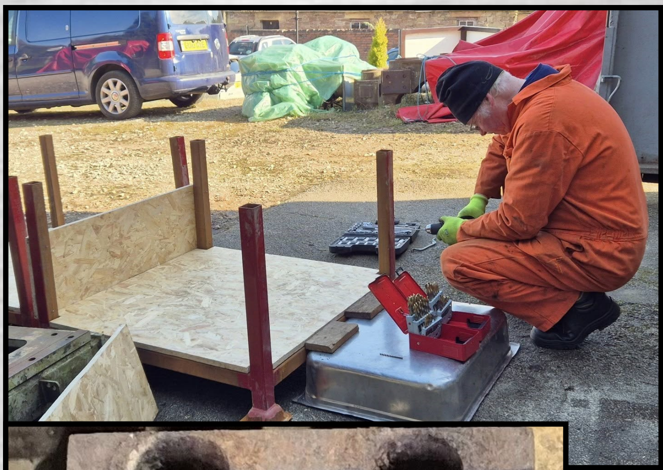
Top Right: Inspecting the stripped motor. Mark Langley.

Above: Upper connector blocks, connector brackets and blowout coils ready to go for plating. Graham Clarke.

Bottom Right: Use of the overhead beam. Mark Langley

ENGINEERING





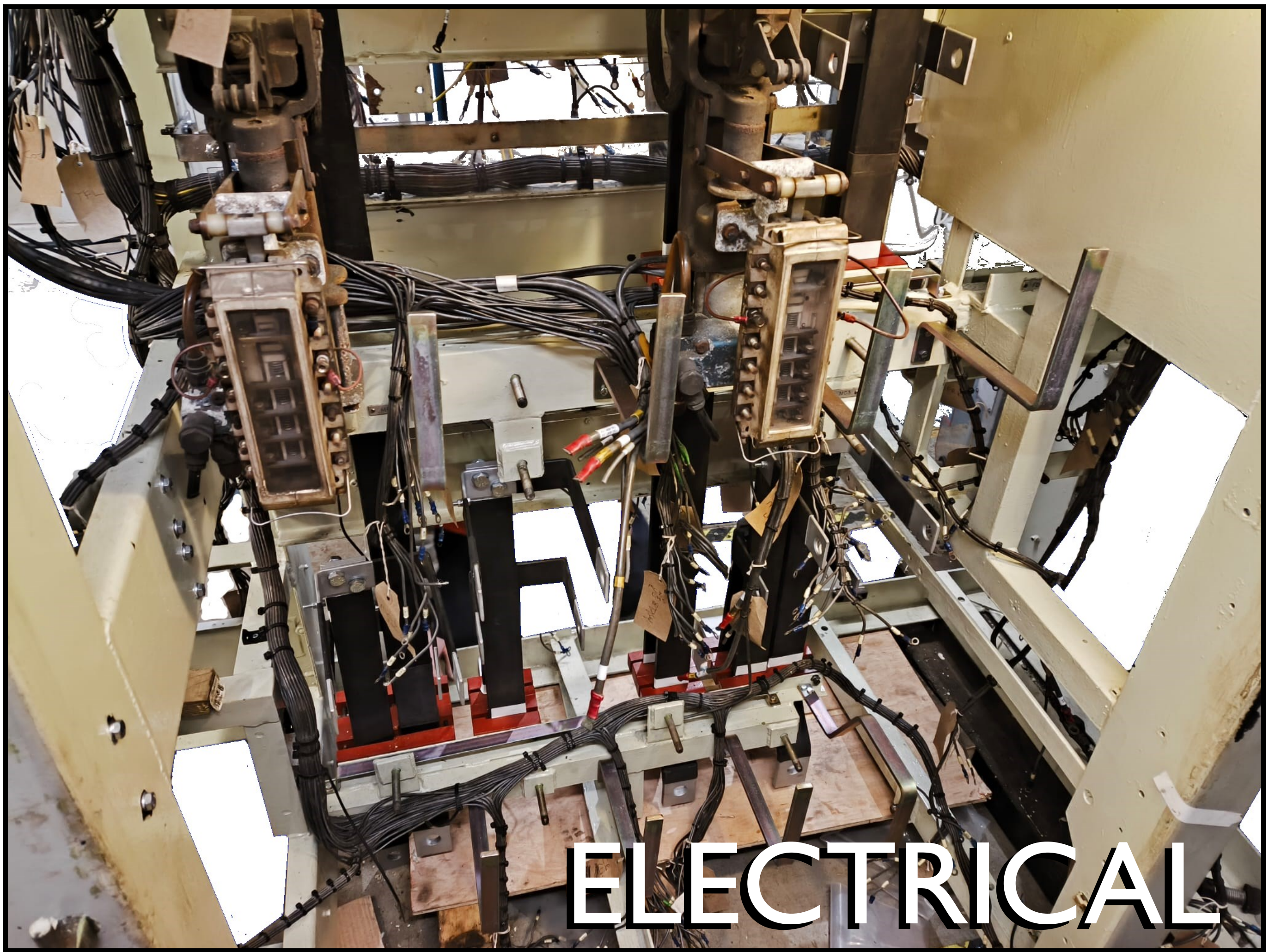
Since the last ICON in the autumn, our work has concentrated on:

- Constructing more storage space, as seen in Marks photo, left.
- Creating technical drawings.
- Consulting with third parties about design accreditation.
- Refurbishing parts.
- Evaluating the ‘least good’ traction motor to establish working methods in the future.

You can see from the accounts presented later, that expenditure is, inevitably, on the up, now that we are refurbishing and purchasing parts.

Above, Before and After.
Parts cleaned in the sand - blaster box. Mark Langley

***Top, opposite page**: Cable tie bars installed in the TM contactor area and TM contactors temporarily fitted to get the busbars clamped up in the right position before the clamps become inaccessible as the build progresses.*
Photo: Adrian Bullock



ELECTRICAL

Graham reports:

Progress is due to the work of a few volunteers but notably, Ady, Bob, Drew and I have been involved the last couple of years.

All the control relays were completed some weeks ago and are overhauled, fully tested to the specification and waiting fitting. They would be in the way during final wiring checks. All the motor contactors are fully stripped and the parts are in the course of inspection and packaging up to go away for plating, as appropriate to their original finish.

The motor contactors are air powered and all of them will receive new solenoid operated control valves, because the originals are in poor condition and not worth overhauling.

Photo to the right: The motor contactor test rig is completed and ready to use. An accurate test gauge has arrived. *Michael Prince*

Looking to the future - Andrew Hoseason

At the recent Twin Peaks Gala, I had the opportunity to be on site when Paul and Graham discussed the finer points of the original D16/1 design and our 'third-of-the-class' design. We also discussed the next steps, notably completion of drawings, creation of 3D modelling and design approval by independent bodies. It was a very useful and inspiring conversation.

At the galas we are asked the same question in a variety of ways: "When will it be finished."   It's a question of money and manpower, not time.   We have small team of talented volunteers. If we attract more talented people with familiarity in the electrical and mechanical fields, to form broader engineering design and management team, then a substantially quicker timeframe would be established.

If money and talented volunteers were available - and we worked 5 days a week - we could be finished in 3 or 4 years. However, there is no precedent since no other new-build diesel has been made in the way our D16/1 is being made. So, we proceed with due care and diligence. To quicken the pace, we hope to employ specialists within a year or so. With funding in place, we can buy more knowledge and expertise to help our current team sprint forward.

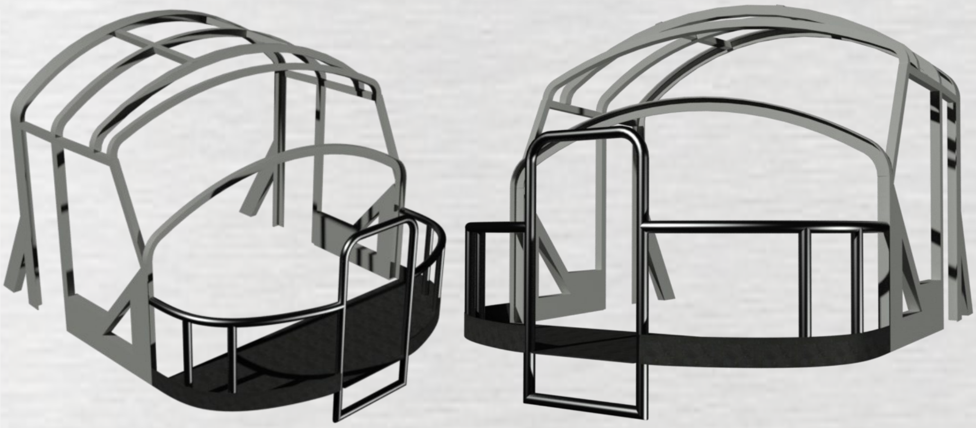
The range of 'next steps' inspires me. For instance, we aim to refurbish and reprofile chassis, create the rolling chassis, identify the ideal brake installation for heritage works and look into high-speed testing.

We have the original drawings and modern safety structure in the nose end has been designed to much improve the safety of the train crew compared to the original locos. The trustees are exploring the construction of cabs. This would create a highly visual (and extremely satisfying) sign of progress. The 'face' of the locomotive will be relatively expensive, with most costs concerning the building of jigs to construct two cabs. The complex curves of the nose ends will be an interesting challenge, but we have overcome everything we have faced so far. We take inspiration from the Baby Deltic group who have achieve much good looking bodywork on their loco.

Cab superstructure. Iain MacIntosh

Below: 10000's cab during construction in 1947. The late Brian Radford's collection MRC-Butterley.

Below right: Cab outer structure. Karl Lambert-Holmes.



A word from the Treasurer - Tony Brown

I hope that you are keeping well and have seen that your membership of the charity has been worthwhile since you joined the Society and that you know just how much we appreciate your continued contributions.

As you will have seen from our updates, we are moving along on a number of fronts, such as the preparation of the electrical cubicle, aiming toward creating the rolling chassis and testing the electrical conductivity of the traction motors. Also, compatible traction motors we purchased from the Netherlands.

These are very exciting times.

We are working with railway industry specialists to gain accreditation to be hauled on Network Rail.

Whilst we feel we are achieving more and more for your project, LMS10000 needs increased donations and more income to ensure we are able to works towards a completed locomotive in the coming few years.

To that end, we are asking our sponsors, donators and members to review their contributions for two reasons.

Firstly, we hope we can find members willing to increase their contribution level. When 10000 is completed, we will offer benefits proportional to the amount each donor has provided to the project. We look forward to sharing those good times with you.

Secondly, we are aware that circumstances can change, and this contact is also to check that even if you cannot increase donations, you are comfortable with your current level of support and they fit with your other financial commitments. We feel we have a duty of care to contact our members now and again.

Of course, lastly, please feel free to spread the word!

If you can introduce a new member with a minimum level contribution of £20 per month we will add these donations to your 'benefits level' for their contributions for the first twelve months.

As it's Rail 200 this year, we are hoping to really increase our visibility at rail events through the year - if you are attending any event local to you, we would be happy to send you material to share if you desired.

Thanks again for your support, see you for a photo in front of LMS10000 as soon as possible!!!

IDRS, 46 Biddick Village Centre, Washington, NE38 7NP
info@LMS10000.co.uk

Cash Summary

Ivatt Diesel Re-creation Society

For the year ended 31 December 2024

	2024	2023	2022	2021	2020
Income					
CoCo Club	1,440.00	1,280.00	1,170.00	1,345.00	1,320.26
Donations to LMS10000	38,171.15	38,072.01	75,073.21	48,204.00	44,205.17
Ebay Sales	345.37	141.16	-	64.70	147.25
HMRC Gift Aid	4,213.86	6,739.69	12,191.80	11,506.17	7,132.52
Interest Income	1,467.84	315.33	16.23	-	0.07
Other Revenue	-	264.94	-	-	-
Refund	189.54	133.99	438.76	-	1,320.48
Restricted Donations to LMS10000	67,325.00	975.00	5,001.00	10,000.00	-
Sale of rolling stock parts	833.33	-	12,833.33	3,791.66	9,220.00
Sales	-	31.14	333.44	4,581.20	2,221.81
Total Income	**113,986.09**	**47,953.26**	**107,057.77**	**79,492.73**	**65,567.56**
Less Expenses					
Accommodation	75.00	-	-	30.00	127.92
AGM Expenses	-	187.50	307.67	-	-
Charitable donations	87.50	-	-	936.54	500.00
CoCo Club Prize	687.50	570.00	599.25	687.50	505.75
Crane Hire	-	-	9,870.00	4,600.00	4,320.00
Duty Tax, Import, Customs	11.49	-	-	-	-
Ebay charges	15.54	15.31	10.50	22.39	29.97
Electricity Centenary Works	1,748.12	509.46	341.46	248.96	1,988.00
Engineering expenses	587.74	670.08	-	-	-
Engineering services	-	-	520.00	880.00	-
Event attendance	-	-	-	-	70.00
Gardening	-	-	-	330.00	200.96
General Expenses	42.17	-	10.57	550.13	281.83
Google Drive (Google One)	2.66	15.96	15.96	10.64	14.89
Health & Safety	49.50	675.00	428.41	-	-
Historical Loan Repayment before 2022	-	-	-	-	1,979.04
HMRC Fine	-	-	-	200.00	-
Insurance	1,071.00	-	-	-	-
Interest Paid	-	-	-	(0.35)	-
Magazine - Artcheck etc	-	5.83	6.99	-	-
Magazine only	543.62	1,342.02	1,199.97	894.00	452.87
Parts for Electrical cubicle	460.92	-	-	-	-
Paypal charges and fees	4.30	18.22	-	0.56	-
Postage, Freight & Courier	781.11	769.54	363.27	356.33	1,144.31
Printing & Stationery	34.58	34.29	-	250.19	148.65
Publicity	1,476.49	1,340.00	3,235.96	6,379.00	3,040.00
Publicity - Leaflets	-	-	112.00	-	-
Publicity - Roller posters	149.96	-	33.33	26.66	-
Purchase of drawings	176.00	-	36.00	1,365.00	1,212.60
Purchase of items to sell	-	-	383.45	5,731.00	3,124.16
Purchase of loco parts	200.00	2,000.00	30,082.28	15,222.34	5,285.00
Purchase of original photographs	446.36	1,859.22	469.29	376.65	394.62
Refurbishment by contractor	-	-	2,286.38	-	-
Rent	-	-	-	650.00	-
Rent Centenary Works	9,180.00	9,180.00	9,180.00	9,180.00	7,956.00
Repayment of bank's error	-	-	1,000.00	-	-
Repayment of unpaid cheque	30.00	150.00	79.00	-	23.00
Road vehicle hire	-	-	-	250.00	-
Software	143.46	67.32	79.99	98.33	-
Staff Training	283.34	-	-	-	540.00
Storage Centenary Works	756.83	-	6,570.00	-	-
Subscriptions	45.00	45.00	10.00	-	13.00
Telephone & Internet	97.66	72.00	82.63	174.56	79.48
Transportation	-	580.00	4,520.00	4,000.00	5,744.00
Travel - International	57.02	-	-	-	-
Travel - National	-	79.98	40.00	101.92	66.43
Website	372.86	208.47	253.34	327.63	294.50

Workshop equipment	13,648.14	-	-	1,393.89	41.67
Workshop signs	12.35	192.96	624.74	471.77	140.48
Workshop supplies	2,608.39	627.17	2,465.40	1,987.55	6,318.65
Xero software	241.50	-	-	-	-
Total Expenses	**36,128.11**	**21,215.33**	**75,217.84**	**57,733.19**	**46,037.78**
Surplus (Deficit)	**77,857.98**	**26,737.93**	**31,839.93**	**21,759.54**	**19,529.78**
Plus Other Cash Movements					
Fixed Assets	-	-	(8,508.99)	-	-
Historical Adjustment	-	(16,815.57)	-	-	-
Loan for Sturgeon	(1,800.00)	(1,800.00)	(1,800.00)	7,800.00	-
Total Other Cash Movements	**(1,800.00)**	**(18,615.57)**	**(10,308.99)**	**7,800.00**	-
Plus Movements in Equity					
Retained Earnings	-	16,815.57	-	-	-
Total Movements in Equity	-	**16,815.57**	-	-	-
Plus VAT Movements					
VAT Collected	442.67	-	2,576.00	1,633.30	444.17
VAT Paid	(4,078.79)	(2,635.59)	(11,479.62)	(8,315.31)	(5,506.63)
Net VAT Movements	**(3,636.12)**	**(2,635.59)**	**(8,903.62)**	**(6,682.01)**	**(5,062.46)**
Net Cash Movement	**72,421.86**	**22,302.34**	**12,627.32**	**22,877.53**	**14,467.32**
Summary					
Opening Balance	**89,090.08**	**66,787.74**	**54,160.42**	**31,282.89**	**16,815.57**
Plus Net Cash Movement	72,421.86	22,302.34	12,627.32	22,877.53	14,467.32
Closing Balance	**161,511.94**	**89,090.08**	**66,787.74**	**54,160.42**	**31,282.89**

ICON is sent in paper version by default, along with an emailed PDF version. If you are content to receive the PDF version only, please let us know via email to info@LMS10000.co.uk

Checking a brake cylinder during testing. Anthony Pilkington

Ventilation for laser cleaning. Paul Etherington

Since the Autumn we have thoroughly updated and augmented our insurance, safety and security systems and the air purification system, which was particularly necessary since we obtained the laser rust and paint remover. Here you can see the yellow flexible pipe which takes dusty air outside the workshop. We have also moved our first aid station to a more prominent site beside the electrical cubicle bay. Photos by Mark Langley

Left, the laser used to remove rust and dirt. Mark Langley.

A welder now refurbished in LMS10000 livery!