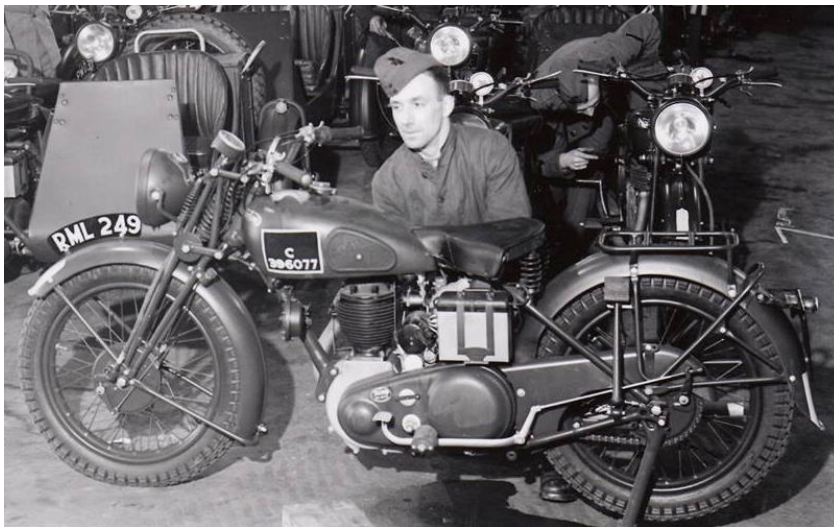


The Lucas C105 “Ni+Fe” battery, an enigma finally solved?

(This article could not have been made without the invaluable help of numerous people: Nick Finney, Henrik Kumm and others from the Alcad Limited firm, Oskarshamn, Sweden, Bastiaan van Niel for lending the original lid, the Lucas archives at the British Motor Industry Heritage Trust, an agricultural machine enthusiast, the person who found an original C105 sample in a dark corner of the storage of Kirby & Sons, Chesterfield and was able to “rescue it from the scrap yard” where it inevitably would have ended!) and a booklet written by G. Scott Atkinson “A short history of the Nickel Cadmium battery” .

Introduction

In the period between 1936 and 1939, most military motorcycles ordered by the British Government were provided with a Lucas “Ni+Fe” alkaline battery instead of the more common Lead Acid version .



Example of 1939 Norton WD16H military motorcycle with “Ni+Fe” battery

An alkaline type battery is very resilient to abuse, electrically and mechanically. The different electrochemical properties, 1,2V per cell for the alkaline and 2,1V for Lead Acid, resulted inevitably in a bigger, heavier (approx. 20%) and more expensive battery to obtain the same output voltage of 6 V. The different types of battery also required alternative Constant Voltage Control regulators (Lucas MCR 1), marked “NI-FE”. Alkaline batteries were used in ships, mining lamps, signal lamps etc. but also as a back- up power source in telephone exchanges and other systems requiring a constant supply of electrical energy.

Towards the end of 1939, a decision appears to have been made to substitute alkaline batteries with the Lead Acid versions. The reasons for this have not been confirmed, but wartime economies in terms of cost, NiFe being over 2,5 times as expensive as Lead Acid batteries, seems likely. Motorcycles already in service were retrofitted and new motorcycles were delivered with a Lead Acid battery, the Lucas PUW7E in most cases. Whether the additional weight of the alkaline unit led to problems with the relatively flimsy battery carriers of MC's used in rough terrain is not known but may have been an issue as well. W.D. Motorcycles fitted with the Lead Acid Battery gained an MCR1 CVC unit marked “LEAD ACID” accordingly. From about half 1942 upwards, regulators did not have any marking.

A number of the more fanatical restorers of pre- and early-war military motorcycles are interested in these Lucas “Ni+Fe” alkaline batteries in order to make period-correct restorations of their machines. A skilled and enthusiastic hobbyist in France has already fabricated moulded boxes to a high standard but without the metal cover and an incorrect information plate on the side. These were based on

what could be seen on contemporary b/w photographs and descriptions in several Lucas parts catalogues, an incredible feat in itself but can now be improved upon to satisfy the 'rivet counters'. The British Lucas archives only possessed an original picture used for the pre-war Lucas catalogue and a scan of a pre-war leaflet in Dutch which by coincidence I had found years before at an autojumble (in the Netherlands).

After a lengthy search over many years and some very good luck it is now fairly clear what these batteries looked like in detail. Collected scraps of information from various magazines, a 1935 drawing from Sweden, a pre-war battery lid from Denmark were the most important clues. This was however topped up more or less accidentally by a Tractor enthusiast going to his life-long Lucas dealer/repair shop in Chesterfield UK (Kirby & Sons) to learn that it was closing down after almost 100 years. He was given the opportunity to look at the remaining stocks and found an unfamiliar battery which in the end appears to be an original, probably post-war, unused (NOS) example.

Manufacturing history

Ni-Fe (Nickel-Iron) batteries had a number of technical drawbacks and therefore the Jungner company developed an alternative type based on the Ni-Cd (Nickel Cadmium) combinations of active cell material. This Ni-Cd development took a number of years (from 1899 to 1912) and during this period the Jungner company maintained the production and sales of the Ni-Fe (Nickel-Iron) based batteries under the trade name "NIFE". When the various difficulties with the Nickel Cadmium based batteries were solved, Jungner kept the NIFE trade name for the entire range of products as it had become a "household name", leading to the confusion that a trade name is not identical to the actual applied materials.

The description used by Lucas, "steel plate batteries", on period advertisements/catalogues did little to prevent the confusion about the active materials used.

During WW1 the British Admiralty was concerned about the effect of German depth charges on the then mechanically weak containers and plates of the lead acid submarine batteries. American experiments with alkaline batteries for this application led to talks between the Admiralty and the Swedish Jungner Ackumulator Co. in 1918 and resulted in a licencing agreement for the manufacture of Ni-Cd batteries by the "Alkaline Batteries Ltd" firm located in Enfield Road, Hunt End, Redditch. Building starting around 1919 under direction of the first General Manager G.S. Atkinson.

The Lucas "Ni+Fe" battery type C105 was most likely designed by the Nife Jungner S.A. firm in Sweden in 1935 as can be found on an original drawing kindly supplied by the Alcad company, the present owner of the "Nife" brand.

The Jungner drawing shows the Nife Jungner logo on the lid. Lucas however advertised the C105 batteries as being their own product but also used the Nife brand logo in this case with the lightning pointers and the "+" in between NI + FE.



Top view showing the combined Lucas/Nife logo and wear marks from the battery carrier straps

The top of the lid suggests that it is a Lucas product to those unaware that the oval and the additional “+” is actually the Nife Jungner brand logo used on British made products under Jungner licence.

The battery lid tells another story on the inside: “Made Expressly for Joseph Lucas Ltd, Birmingham, England by Batteries Ltd, Redditch”. This may also be the reason there is not much technical information to be found in the Lucas archives. It was certainly a misty mix until all the interconnections were realised.



Text on the inside of the battery lid

THE “LUCAS-NIFE ” STEEL-PLATE BATTERY.

This has many greatly improved features. It has 5 cells instead of the original 4, giving much greater reserve. This ensures an excellent bright, steady light under all conditions—even when standing, dynamo not on charge, or with electric horn in use.

The stainless sheet steel container which houses the actual battery box of moulded “Milam” gives tremendously increased strength and effectually prevents damage to the “Milam” moulding. The design of vent plug prevents spillage.

This Battery is clean and neat in design, with a strong moulding which gives it a pleasing appearance and great solidity.

The chief advantages of “LUCAS-NIFE ” Steel-Plate Batteries :—

- No Lead. No Acid. No Sulphation even if misused.
- Undamaged by neglect ; can be left standing for months charged or discharged without harm. Can even be short-circuited without damage.
- Almost indestructible ; require no attention beyond occasional addition of distilled water. Steel Plates absolutely unaffected by vibration.

Code Work.	Type.	Volts	Amp.		Overall Dimensions in Ins.			CASH PRICE EACH	
			10 hrs.	20 hrs.	Length.	Width.	Height.		
ACDYO	C105	6	10	11½	7½	5½	6½	Battery only	2 5 0
ACWAT	C105	6	10	11½	—	—	—	With Carrier	2 10 0

Special Electrolyte for “ Lucas-Nife ” Batteries, 3/9 per pint.



Lucas catalogue Nife description of the mid 1930s

The Lucas/Nife C105 was manufactured by Batteries Ltd from around 1936 and was still advertised by Lucas in the 1950 catalogue. It is not certain when the production finally ended but probably not long after that. Another lid for the model, C124, surfaced some years ago and is likely to have been 4,8 V based on the size of the lid but no more information has been found about it.

Battery construction and evolution

The battery box itself and the lid were made using a hard rubber compound, named Milam by Lucas/Batteries Ltd, an acronym for “Moulded In Lucas Acid-proof Material”.

The material is defined as Ebonite in the Nife Jungner drawing (Ebonite is a brand name of a development from 1851 given to it by Hugh Silver, an English businessman but developed by Nelson Goodyear, brother of Charles Goodyear.)

Hard rubber is a vulcanised natural rubber using long duration vulcanisation and several additional compounds like, sulphur, linseed oil and zinc oxide (from Wikipedia).

The stainless steel casing was defined as 0,7 mm thickness on the Jungner drawing but on the recently found item it was made from 0,635 mm (0.025”) stainless steel plate material.

It is not a leak proof metal cover, as some enthusiasts had surmised, but a fairly loose sheet metal protection.

The base is a separate flat sheet held in place by the lower lip of the outer cover.

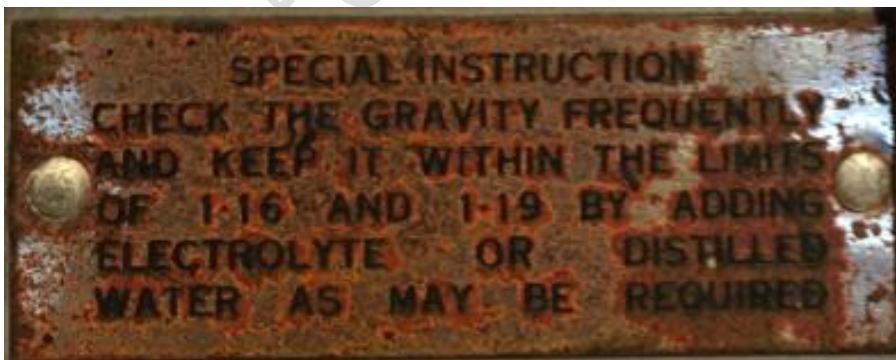
The underside corners are relieved. The Picture below shows it clearly, as well as the construction of the side seam. The “open” end of both side seams are pointing backwards.



The Lower lip and the “folded and grooved” side seam of the sheet metal cover

It appears but is not certain, that the sheet metal is bonded to the moulded box but it is not clear what type of adhesive may have been used at the time. It was either rubber, phenolic or tar based material.

At the front, a small 2” x 3/4”, probably tin-plated steel, maintenance instruction plate is fixed with two rivets. Initially it was thought that this would be a manufacturers identification but it is now clear that it relates to maintenance instructions. It is assumed the text is identical to the prewar version.



Maintenance instruction plate on front of the battery

Differences found between the Nife Jungner drawing and the recently located British made battery

The different logo's on top of the lid.

The use of Imperial threaded parts instead of the Metric versions.

The use of bolts instead of studs and nuts for fixing the connecting plates between the cells

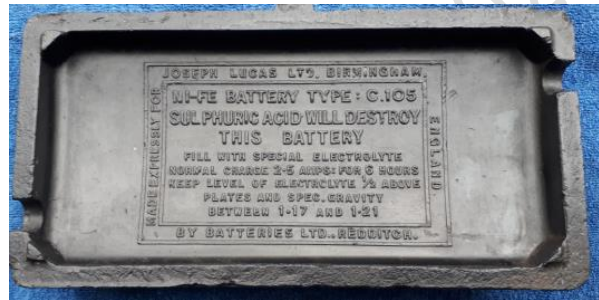
The use of different diameter bolts for connecting the cells, most likely a production improvement to prevent cells to be connected improperly.

The use of red and black plastic encapsulated nuts on the bolts to which the electrical wiring of the vehicle is fitted instead of the stainless steel nuts as defined on drawing.

The addition of the text "DO NOT USE ACID" on the strips connecting the cells.

The visible differences from the pre-war versions, as can be gathered from the available information and contemporary pictures are found on:

The inside of the lid, which on this later battery is provided with ribs.



A slightly altered, depressed logo oval on top of the lid, likely in relation to the new lid mould.



Black and red coloured plastic encapsulated nuts instead of the stainless steel nuts clearly visible on pre-war pictures.



It is not known whether the pre-war batteries had any text on the connecting strips.

With all this information it is finally possible to make reproduction battery boxes with the correct original visual outer appearance for pre- and early-war British Military motorcycles.

Reproduction of Lucas C105 "Ni+Fe" of batteries

During 2023, a French battery reproduction enthusiast in combination with a Belgian metals magician have been able to manufacture a high quality and externally correct Lucas C105 battery reproduction. Lack of an original example of a pre-war C105 leaves a slightly uncertain configuration of the inside but what has been achieved will not be far from the truth.

The original C105 lid found in Denmark was sadly destroyed in a fire gutting the BSA collection, bikes, irreplaceable parts and tools of the owner. Luckily moulds were made from the lid before the fire which are now used to make the French reproduction lid.



French/Belgian reproduction of a Lucas C105 "Ni+Fe" battery.

Whether or not the internals will be reproduced is not certain but there is more information available than ever before and it may be enough to permit this.

The quest to find a real pre-war battery is still not over but locating this (believed to be) post-war version has solved a lot of mysteries already.