

The 762 Club

*Building No 762 Baldwin locomotive Lyn
for the Lynton & Barnstaple Railway*

Newsletter No 2 – Summer 2010



Introduction

Welcome to Newsletter No 2 of the 762 Club with the progress and activities of our collective mission to bring the new-build Baldwin 2-4-2T locomotive, Southern Railway No 762 *Lyn*, to the legendary Lynton and Barnstaple Railway.

Highlights

- Alan Keef Ltd contracted for final assembly and testing
- Operating design parameters complete
- Cab in final stages – will be at Woody Bay set up for September Gala and the visit of *Lyd* – 25th to 27th September 2010.

At present we have 33% of the membership shares taken. This is a remarkable success for a project of this kind, especially during the current economic climate and in such a short period since the launch. This is an almost unprecedented success for a project of this type and the indications are that we can be optimistic regarding future take-up and overall income. As we have said before, only 350 shares will ever be available, and once they've gone they've gone.

In addition to membership shares there has been much interest in the sponsor-an-item list. Have a look at the details on the website to see if you would like to buy a part.

The enclosed letter deals with the subtle changes we are making to the company profile. The overall effect is that the 762 Club will retain ownership of *Lyn* and the rather tortuous way to claim Gift Aid will be very much more direct. It will take a short while to register with the Charity Commission and when that is completed we will be in a position to claim all the Gift Aid due to date.

As covered in the letter, this was an unwelcome interruption and was created by a non-member. However, in the event the outcome will be beneficial.

The change from 'shares' to 'membership share' reflects the fact that the 762 Club will be a charitable company (charity) in its own right and will therefore retain the ownership of the locomotive. There is no tangible effect in reality.

Progress to date

Whilst it may have appeared quiet on the 'news' front, there have been a number of significant developments on the build side of the locomotive which will enable us to move forward. A full set of modern production drawings is being created with updated design criteria. This work is vital to create a locomotive which will deliver all the requirements for use on the L&B. However, this work does not deliver locomotive parts - so patience is the watchword and keep up the continued support.

Award of final assembly contract to Alan Keef Ltd

We are pleased to announce that suitable terms have been agreed with Alan Keef Ltd Light Railway Engineers and Locomotive builders to undertake the final assembly of the locomotive. This has been split into 15 separate stages. The components will be manufactured according to the detailed construction drawings, with final assembly and fitting taking place at the Ross-on-Wye works of Alan Keef Ltd. All parts will be delivered and stored at Keef's. Patrick Keef will also be involved through the process to ensure continuity throughout the project and will bring his extensive experience to the project team.

Patrick Keef has previous experience with Baldwin locomotives as the company was awarded the contract by the Greensands Trust to restore 4-6-0 Baldwin No. 778 (built in 1917) to working order and is currently rebuilding another ex-WD 4-6-0 for the Welsh Highland Heritage Railway.



Photo of Patrick Keef at the controls of 778 on one of the loco's running-in trips – J. Tilston.

Modelling and estimating key locomotive performance requirements

Lyn is a replacement locomotive which the Lynton & Barnstaple Railway expects to work significantly harder in traffic than its predecessor. It is anticipated that the locomotive will be required to haul up to six heritage coaches on occasion, a significant maximum load increase over the original which was normally limited to four coaches.

The original coaches were slightly heavier than the heritage coaches currently under construction as these use aluminium cladding in place of steel on the body and lighter bogies with roller bearing axles. The railway has photographic evidence that the original locomotive on occasion pulled five coaches from Barnstaple to Lynton and as a train of six rebuilt heritage coaches would have a similar weight, it was hoped that analysis would demonstrate that the proposed increase in haulage capacity would be practical.

Whilst it is fairly easy to establish that it is possible to start and move the desired maximum load, assessing the practicality of hauling such a train to time necessitated a significant amount of mathematical modelling!

To evaluate the design implications for the new locomotive, a computer model of the railway was created on which the locomotive and train was 'driven' in order to establish the key performance parameters required from the locomotive. This established a number of issues key to the overall design of the locomotive:

- The power demand required to keep to scheduled time
- The evaporation and combustion rates necessary to meet demand and in particular establish whether a 'Producer Gas Combustion System' (PGCS) would be beneficial or even essential to minimise unburnt fuel losses

- The total fuel and water consumption and hence storage capacity required on the locomotive

The model of the line was based on the original survey documents, with every curve and speed restriction modelled and using the original 100-minute timetable schedule as a reference. *Lyn* and six fully laden coaches have completed their first 'virtual' trip from Barnstaple to Lynton, calling at all the stations and halts along the way.

The initial 3.5 miles require only moderate power but once the serious climbing starts, high sustained output is needed averaging around 250 indicated horsepower (ihp) with a peak at 15.8 miles just before Woody Bay of 339 ihp at a speed of 22mph on the 1 in 50 gradient.

Lynton is reached, including stops at all stations and halts, in 106.5 mins. As comparison of the train speed with the permitted line speed reveals close matching, arriving on time is clearly contingent on being able to pass through at least one halt without stopping, and provision of any additional power would have little benefit.

The model also clearly shows that a high tractive effort is required and so fitment of reliable sanding gear will be essential as Exmoor is not always bright and sunny and adhesion needs to be maintained under all weather conditions. As sanding adds significantly to the rolling resistance of the train, it may also be advisable to fit rail washers to clean the rails between the locomotive and coaches so that they do not have to roll over the sand deposit. Additionally, lubricant contaminating the running surface of a locomotive driving wheel can have an adverse effect on traction. So although the locomotive bearings will be grease- rather than oil-lubricated (which is a great help in these situations), the use of a Porta high-adhesion wheel profile will be used for the driving wheels to avoid any potential problems. The Porta profile incorporates a narrow 'flinger' groove in the standard tyre profile near the outer edge of the tyre and simply prevents migration of contaminants onto the contact patch area between the tyre and the rail head.

The high power outputs mentioned earlier require the boiler to generate sufficient steam to meet the demand, which in turn necessitates efficient combustion of enough fuel to evaporate the water. In its original form, while the locomotive would have been able to haul the train over the line it would have been unable to generate sufficient power to keep time. Progress would have been controlled by the boiler grate limit, which is the point at which the draught passing through the fire has such a high velocity that the firebed becomes fluidised and a high proportion of the fuel fired is ejected unburnt from the chimney - which would be bad news for both the National Park and operating costs!

To overcome this problem the first requirement is to extract as much energy from the steam as possible to minimise the quantity of fuel to be burnt.

To enable this we will:

- Raise the boiler pressure from 180 psi to 250 psi and compensate for the increased pressure by reducing the cylinder bore so that although the tractive effort remains similar, condensation in the cylinders and flow losses in the steam circuit and cylinders are reduced

- Provide a superheater as this will significantly reduce condensation losses and water consumption
- Fit an exhaust steam injector to provide feed water heating to recover some energy from the exhaust which would otherwise be wasted.

As combustion rates will still be too high for conventional firing without excessive unburnt fuel losses, a PGCS will also be incorporated which will have two benefits:

- Unburnt fuel losses are greatly reduced as the primary air flow through the firegrate will be reduced to about 30% of conventional firing
- Clinker formation is avoided as the firebed burns at a dull red below the ash fusion temperature. Thus a PGCS-fitted locomotive can work continuously without the deterioration in performance that occurs with conventional firing. This is achieved by entraining exhaust steam in the primary air stream below the grate to create the producer gas (Carbon Monoxide) which is burnt over the top of the fire in the secondary air.

The features above will be incorporated into the design and will enable the locomotive to travel from Barnstaple to Lynton with five or six fully laden coaches evaporating around 1989 kg of water and consuming 322kg of coal with adequate reserves.

Lyn's Cab

When Baldwin Locomotive Works wanted a cab for a loco in production, they just sent an order to the carpenters' workshop to produce a cab to whatever dimensions were required. The details used do not appear to have survived – if indeed they ever existed!

Producing the drawings for a finalised cab just as *Lyn* carried was not exactly straightforward. The GA drawings have the dimensions of the original production of 1898 but no clues of the material, sizes, joints, windows and so on.

Using a great number of photographs enlarged to show various details, a picture emerged. The reasons for various bolts, location of main frame members and so on all began to become apparent. The basic frame is constructed in ash. A source of ash free of charge had to be refused as UK sawmills work only with ash from a known and certified source. The reason is simple: ash has a tendency to grow around metal and items such as nails, fencing, old bikes etc have been found. When that debris occurs, the saw blades suffer and are very expensive to replace. Fortunately, the source of commercially available ash in the UK happens to be American - and at very good rates too!

The infill panels are steel. These steel panels are 10 gauge = 1/8" (or 3mm in foreign) and have been laser-cut from galvanised sheeting. They are let into grooves cut in the timber sections in the same way as door panels are let in.

The various windows are hardwood with screw-fixed beads to retain the glazing. Originally Baldwin used 3/16" glass, which is amazingly thin and delicate. We will be using 6mm laminated or toughened glass.

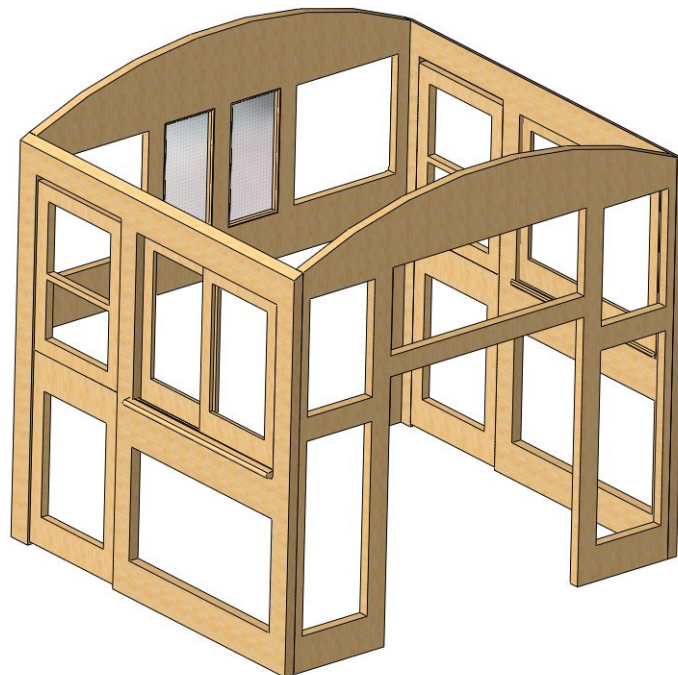
Whilst preparing the dimensioned drawings, we realised why the door head appeared to increase in height in the 1920s. That was after wooden floor boarding was fitted (before that the cab floor was plain steel sheeting). In order to avoid modifying the door, the head of the opening was raised by just over 1". In fact that was probably as well; the cab door is only 60 ¾" high – ideal for short crews!

The cab roof was tongued-and-grooved timber boarded and covered with metal sheeting. At this stage we will have the timber – in three sections for ease of transport – and cover it with the metal cladding on erection on the loco.

The sides were bolted onto the ends with seven bolts per side. The bunker bolts and screws onto the wooden structure and overlaps up to the cab doorway. This assembly means that we could 'flat-pack' the cab and transport and store it in a trailer until final assembly is required. Alternatively, the cab may be assembled and mounted on a trailer for movement to various shows until it is required for final assembly. The loan of a suitable trailer for two years (or less) would be very much appreciated.

The overall cab will be as close as anyone could get to the original. To have all those nice windows to shut out the nasty, wet Exmoor weather would definitely appeal to loco crews – and the ventilation obtained when they are opened on fine days will be most appealing too!

Standing in the cab brings the dry drawings and photographs to life. It also explains why the crews were normally seen seated in the cab as headroom is restricted in the doorways although there is plenty of room once inside and away from the eaves – maybe that is why the driver is seated in so many photos?



CAD image of the finished cab structure which is in the final stages of construction.

Finance

The final completion date of the locomotive is still planned to be in 2012. Delivery of the completed locomotive depends of course on the acquisition of additional shareholders and once the structural change has been completed there will be a significant promotion of acquiring new members. There will be only 350 shareholders and as mentioned before, the take-up to date has been excellent. We already have our first Mr 10%!

The Club is of course VAT-registered to allow it to reclaim the VAT on purchases related to the design and build of the locomotive. Expenditure is tightly controlled to ensure that the Club runs with the minimum of overheads in order to maximise the monies available to invest in the loco.

Sponsor a Part

People have also expressed an interest in donating to the project without committing to buying a share. To facilitate this we have the sponsor-a-part scheme. This opportunity is open to shareholders and non-shareholders alike. In addition you could sponsor a part perhaps as a gift for the friend or loved one who 'has everything' – for details keep an eye on The 762 Club website where the list will expand as new items are required www.762Club.com. Parts you will ultimately be able to sponsor will include various items of the locomotive at various prices and in return there is an attractive range of incentives, alongside a bespoke certificate for each item sponsored, which are listed on the website.

Baldwins surviving worldwide

One of the 762 Club Directors was in South America for work in January this year and was able to take a few days' break and visit the "Trochita" in southern Argentina. The only revenue-earning Baldwins still active in that country operate the "Ferrocarril General Roca" in the Argentinian provinces of Chubut and Rio Negro. The 2' 6" gauge line extends over 402 kilometres from Ing. Jacobacci in Rio Negro to Esquel in Chubut, accumulating 646 curves along the way, one tunnel and several bridges. The whole trip takes two full days to complete.

The line has a total of 22 steam locomotives, 11 German built Henschels and 11 American Baldwins, three of which are currently operable. The locomotives are oil-fired and have been in service for over seventy years. Most of the rolling stock also dates from 1922.

It was interesting to note that Baldwin No. 16 which headed the train was run for over twelve hours on the first day, with the only stops being for water and regular oil rounds of the locomotive's valve gear and bearings. The engines are operated on full regulator and driven on the reverser. It is testimony to the rugged Baldwin design that these locomotives are still used in revenue-earning service today.



Baldwin No.16 stopped on route for a regular oil round.



Baldwin No.16 in the middle of the Argentinian Pampa showing the bleak operating environment. Additional water is carried in the tanker wagon behind the tender.



In the main workshops one of the Baldwins was undergoing a full general overhaul. The works can handle all aspects of the repairs. This image shows the typical Baldwin compensated springing arrangement.

How can you help?

Firstly by virtue of the fact that this newsletter was sent to you today you have been contributing at the outset of this project and our sincere thanks for your support are due. You can help by spreading the word, identifying other interested prospective shareholders or donors. You might be interested in buying additional shares and we encourage you to do this.

This project is the first to deliver a new-build of one of the original L&B locomotives. What a magnificent achievement that will be for the Lynton & Barnstaple Railway: the sight and sound of Lyn hauling her train

“It’s going to happen, it’s started and you have helped to make it happen”