On the 29th April 2006, 25NC No 3472 ran again for after six years of rest. It was decided to take her on a long trip, 15F in tow (just in case) from Germiston to Bethal. Given her all roller bearing motion design, this was the job she was designed for - long distance, high speed travel with heavy loads. Sadly due to restrictions imposed on us, this locomotives potential will probably never again be fully realised.

25NC and 15F double heading

We leased this engine from the Transnet Heritage Foundation (THF) some years ago and used her on various trains over a number of years with no mentionable problems, apart from having to do a valve and piston exam, which entailed the replacement of the strange piston rings!! These consist of a ring of segments, half iron, half bronze, with a spring ring on the inside of these, which is supposed to press them againsed the cylinder walls when running.This was well when assembled in the cylinder, but not when outside of it, as everything has a tendency to shoot off in all directions while trying to get the sods into the cylinder under spring tension. The answer lay in compressing them outside the cylinder with an outside ring compressor similar to that used by motorcar mechanics - that is if you could get them compressed enough!

During this exam we also discovered that the right hand side crosshead was loose of the piston rod, and had excessive play in the sidebar - approximately 10mm vertically to be more precise. The slidebar was measured up and machined to size, but the piston rod was another story. The crosshead on the 25 is split vertically and bolted together around tapered shoulders on the rod end. These had worn so much that the crosshead would no longer grip on the taper faces, but only on the rod, which slipped back and forth by about 5mm causing strange markings on the cylinder covers. Luckily THF came to the rescue by supplying us with a replacement crosshead of which there are very few left.

Meanwhile, back at the boiler end, it had become time for boiler recertification. At that time, Spoornet no nonger did inspections and we had to make use of commercial inspection authorities which proved to be a problem in itself. None of them had any experience in locomotive boilers, and so declined the pleasure of inspecting ours. By chance we discovered that one of the inspection companies had employed Johan Smith who was one of our previous Spoornet inspectors. Problem solved, or so we thought. We had set too, and prepared the boiler for a visual inspection. This examinantion is to look for any signs of cracking or corrosion. All was well until Johan and Davy Olivier (the boiler inspectors) examined the safety valve seats and discovered serious cracking between the two Hardy valves.

An explanantion may be required here. The original 25 design had four 2 1/2" Ross safety valves grouped on a square plate behind the dome, but at a later date, two of the valves were replaced with bigger 4" Hardy valves, by simply boring out the existing holes and fitting them, leaving a web of a mere 1" between the two new holes. As you can well imagine - this leads to cracking. A 5/8" reinforcing plate had been fitted under the boiler plate, most likely as a result of prior cracking. The safety valves were thus mounted on a reinforcing plate of 5/8" followed by a boiler shell of 7/8" and a saddle plate, a total thickness of 1 3/4". The crack had passed through both the reinforcing plate, the boiler shell and was just showing signs of breaching the saddle plate. It could also be seen that this area had been previously welded up, an attempt in vain to repair the same problem in the past.

The problem

Neither Johan, nor Davy would attempt a similar repair. Another permanent solution would need to be found. After some head scratching (splinters not withstanding) Andrew suggested that to save serious surgery, we put the two bigger Hardy valves diagonally opposite one another, on a new saddle plate. This was agreed upon, subject to it being possible in the available space and obviously still meeting the strict South African boiler specifications. As this was going to be a modification and not just a simple repair, a whole new plan would need to drawn up to current pressure vessel specifications. Andrew went away and read up on all the requirements in conjunction with Johan, and Davy's inputs. The first design was met with approval much to the amazement of all three parties!

What we decided on, was to cut out the whole piece of the boiler around the safety valve saddle, and fabricate a whole new piece including the stiffening plate, boiler shell and saddle plate to the new design. This would be riveted together to form one piece, and then have the safety valve openings bored to suit after which the entire plate would be welded back into place. It sounds so easy when writing it down now. The first problem was that no 7/8" plate could be obtained, so 1" plate was substituted. The company that Andrew works for had rolling and forging facilities, so much of the work could be done there. The second problem was finding a company with facilities to machine a 3' 2 1/2" radius on the underside of the saddle plate to suit the boiler barrel diameter. This problem was also luckily solved through contacts in the industry. Next up was finding suitable rivets. Go to your local fastening supplier and ask them for 80 1" x 5" pan head rivets and see how long it takes for them to stop laughing! We were getting quotes for five to six weeks lead time to manufacture them, which in itself was not a problem, however we had been asked to run a train to De Aar which needed two engines - 15F No. 3016 and if possible, a 25 class due to the long distance and power capabilities of this engine.

Although this was the situation back then, the result was that we missed the deadline and had to use two 15F's instead - with interesting results - another story for another time. Back to the rivets - again THF came to our rescue, having suitable rivets in stock at their Millsite offices.

Andrew spent a week at work literally burning midnight oil to get all the rivet holes drilled and countersunk, and the plates roughed ready for riveting. That weekend, Eddie Tulloch, Aiden Mcarthy and Peter Labuschagne joined Andrew at work to get down to some serious riveting. The plates were set up in the hydraulic press close to the furnace to hold it all in place. Having last used a rivet gun 20 odd years ago, and the other guys much the same, everyone needed to get back into the swing of things - those guns give a hell of a kick!! Eddie was cutting rivets and Aiden was heating them in the furnace ready for use. The rivets had to be heated to at least 1200 degrees celcius to work long enough, and the plates themselves had to be heated so as not to allow the plates to cool down too quickly, else they would not expand into the holes properly.

Riveting

We were using countersunk, half countersunk and snap heads on various places over the plate, giving us lots of practice. The plates were first bolted together to stop creepage. The hot rivets were inserted and worked from both sides, forming suitable heads. This process was repeated until all the rivets were in place. The whole procedure took two days. The lads can be quite proud of themselves - out of sixty three rivets, they only managed to mess up on four of them. As for removing those four, however..... Next up was the boring of the holes, and the drilling and tapping of the stud mounts.

While busy on the above, Andrew was desperately looking for someone to weld up the boiler. While there are plenty of boiler companies around, none of them had welders capable of 1" plate. For those who may not know, a coded welder is only certified to weld certain thicknesses of material - 1" is not your standard size! Those that did indeed have the ability to do it, were quoting prices that closely resembled their telephone numbers. This problem, incidently was the final blow in the hope of using the engine to De Aar, forcing an alternative to be found. In the meantime, we had been fitting the new patch to the boiler by trimming and grinding to the exact profiles required by the welding schedules. There we were, ready to go - but nobody to weld. Most frustrating and downright demoralising.

Ready to go...but no welder

Two years passed - there was simply no money to finish the job. Then, by chance, Gabor Kovaks at a model steam train event introduced Babcock to our delema. They came around and had a look at the job, worked through the drawings and specifications required, and said that they would be able to assist us with pleasure at our earliest convinience. What a sight that was - especially the way the welder's face lit up when he arrived to not just weld any old steam vessel - but a steam engine boiler!!

The next step was to get everything water and steam tight in preperation for the boiler inspectors. This involves a process called caulking. This is a process of hammering the metal together with special shaped tools, driven by an air hammer to distort the seams with more pressure than the water or steam can exert to prevent leaks - crude, but effective. Welding of seams is not possible as this allows for no expansion to take place. A boiler of this size can expand by 1/4" in

diameter and 1/2" in length when hot. You can see therefore, why the cracks between the safety valves formed in the first place. The radial forces on a boiler are far greater than longitudinaly.

Ready to test

The rest as they say - is history. The inspector came, and the boiler passed with flying colours. Thanks to a few dedicated volunteers, and especially to Babcock - another piece of South African history is saved, not only to be plinthed as a museum piece, but to serve as a running example of the motive power that moved tons of South African freight and thousands of passengers.

- Andrew King -

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