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Switzerland - an Engineers View - Hugh Mothersole Martin Long

On Friday the 2nd of April, members were entertained by our Treasurer, Hugh, with more of his European Travels in search of steam. This time Hugh took us to the lakes and mountains of Switzerland. Travelling by Eurostar and TGV and using the Swiss travel card which allows unlimited use of all forms of public transport in the country, Hugh started on Lake Geneva and showed us the steam paddle boats which ply up and down the lake. These wonderful machines have been working for many years and looked to be as good as new. By dint of some arm waving tactics, Hugh was able to get into the engine rooms and showed us the sparkling clean machinery in use. Further trips to the steam on Lake Lucerne and the two lakes at Interlaken, produced more steamers of differing types but still beautifully restored. Lucerne also houses the Swiss National Transport Museum and Hugh took us on an all too brief tour of this. He advised that to do the museum justice, one needed to spend two days there such are the volume and quality of items on display. A short visit to the steam rack railway at Blombey was made which like all Swiss railways looked to be a fascinating mixture of ancient and modern practice. One of the highlights of the trip was the festivities of the Swiss National Day when all the steamers on the lakes are decorated and steam in line abreast down the lakes in the evening which is rounded off with bands playing and firework displays. In the second part of the presentation, Hugh showed us a Swiss Video of the steam boats which was fascination even though my German and I suspect that of most of the members was not really up to the commentary.
Once again Hugh has wetted my appetite to go and see this Swiss Travel Wonderland for myself. A wonderful evening. Thank you Hugh.

PUMP POWER LOSS Geoff King

I was interested in Malcolm Bradfords letter regarding his axle pump and the power that he claims that is absorbed when in use. Robert and I have six locomotives between us, 4 with pumps and 2 with injectors only. In none of the locomotives with pumps can you tell by the power output whether the pump is putting water into the boiler or back into the tender. For sure, the pressure gauge shows a drop in pressure due to the cold water entering the boiler, but not a drop in performance due to power being absorbed by the pump. So what is happening on Malcolm's locomotive to be so noticeable to detect a drop in performance?
Ideally, the pump delivery should just balance the water used as steam taken from the boiler. However, this is not practical as it does not allow for the water level to be recovered when [if] it is allowed to get low. There are occasions when it is desirable to allow the boiler to take a rest from an input of cold water i.e. when steam demand is high going uphill. The water level is then recovered on the next downhill part of the track.
I would suggest that a figure of one and a half times the maximum evaporation rate of the boiler would be about the right figure to aim for when sizing the pump on a model. It is difficult to know how much water a pump is delivering as we do not know the pumps efficiency. The lift of the ball valves, air leaks, and cavitation on the suction stroke of the pump will all reduce the pump output. All we can do is to assume 100% efficiency and calculate the pumps displacement.
My own 8F has a pump of 11 mm bore and 10 mm stroke. It is easier to work in metric units for our purpose. The output is $\pi \times r^2 \times$ stroke, which is 3.142 x 5.5 x 5.5 x 10 cubic mm. Divide the result by 1000 to gives a figure of 0.95 cc per revolution of the wheels.

The wheels are 3½" in diameter and if we work this out as π x D = the wheel circumference of 10.995" the wheels will revolve 1091 times per 1000 feet of track. Therefore the pump delivery will be 0.95 x 1091 cc per 1000 ft of track which is 1036.5 cc or just over one litre per lap. I can assure you that this output is more than enough to keep the boiler FULL if you leave the pump on for too long, as many drivers on a Wednesday will confirm.
Doing the same calculation for my little Virginia which has a pump of 8 mm diameter ram and a 16 mm stroke, with wheels of 3 7/8" diameter gives a pump delivery of O.84 litres per 1000 ft run, a little less than one lap of our track.
We now come to the pump that Martin Evans specified for his Simplex design. This is a double acting pump, delivering water on both the inward and outward stroke of the pump. As drawn the bore is 16 mm diameter and stroke is also 16 mm for the inwards direction which gives 1.96 cc per stroke, allowing for the pump rod. On the outwards stroke the delivery is also 1.96 cc which together gives 3.92 cc per wheel rotation. Simplex has a wheel diameter of 4 3/8" and will rotate 873 times per 1000 ft of track. The pump output is therefore 873 x 3.92 cc which is 3.4 litres of water.
There is no way a Simplex boiler can evaporate that quantity of water per 1000 ft of track, that is, less than one lap of our track This accounts for Malcolm's severe loss of boiler pressure when the pump bypass is closed and all the water is going into the boiler. That amount of cold water entering a boiler would kill even a large boiler, a Britannia perhaps.
The power lost may well be noticed when this amount of water is being pumped when the bypass is closed. However, there should be no noticeable loss of power when the bypass is open if the passage ways through the pump valves are of adequate size as no pressure is generated. No pressure means no work is being done, only friction against the pipe work walls, which at our flow rates and speeds would be too tiny to measure.
One suspect area is the little nicks which designers seem to favour in the delivery valve to prevent hydraulic locks from occurring. In most cases these are not large enough when fast running and hold back a loco due to hydraulic resistance.
Another item sometimes ignored is the size of the bypass valve and pipe work.
The passage ways must be large enough to pass the peak water flow back to the tender for there to be NO pressure peaks when the pump delivers water. To over state the point, any pressure equals power loss in the system.
To finish I think that the Editors closing comment was correct. If you can notice a change in a locos performance when the bypass is closed then something is very wrong.
All our engines will drift down the hill into the station at our track with the pump bypass closed, full boiler pressure, and with the regulator closed.
If you feel that I have shown anyone how to suck an egg, then this letter was not intended to be read by you.
It looks as if the pump specified for Simplex is delivering about three times the amount of water required. Anyone with a Simplex prepared to make a pump with, say, the same stroke and the main bore 3/8" and the pump rod 7/32" leaving all the other passages the same? (I suggested this to Malcolm but he was not enthusiastic!) Ed.

A CAUTIONARY TALE

Kelvin Carter

Dear Fellow Members, I do rather feel that our editor is scraping the barrel when he suggests that I write a short note about a workshop fire that occurred recently. Neither do I support the natural reaction of the Health and Safety movement who react like decapitated domestic fowls and invariably make generalisations from the particular.