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BODENSEE-TOGGENBURG BAHN

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BT Re 4/4 456 092 at Rapperswil with a Voralpen Express. 29/02/00. Photo: John Atkinson

It is a pleasure for me to address and welcome you, who are compatriots and more or less direct descendants of Stephenson, the inventor and builder of The Rocket. Since that famous locomotive race in Rainhall in the year 1829 the railway has no doubt made great progress, but without the British inquiring minds of that period - Stephenson was not the only inventor of genius who opened the way that led to the heyday of the steam age - neither you nor I would be right here today.

The Bodensee-Toggenburg-Bahn (BT) is, compared to the British, but also to the Swiss railways, a rather young railway. It was only in 1904 that the "Baugesellschaft" Bodensee-Toggenburg-Bahn was founded, and since 1910, that is for around 90 years now, the iron horse has been running between Romanshorn and Wattwil.

Today the BT trains are running not only on their own network which extends from Romanshorn via St Gallen to Wattwil and to a stub-end line ending between Ebnat-Kappel and Nesslau-Neu St Johann, but also on the lines of the Mittelthurgaubahn (as far as Schaffhausen), and of the SBB (to Heerbrugg and Wil). Of great importance is the "Voralpen Express" with its direct Interregio trains from Romanshorn via St Gallen, Wattwil, Rapperswil and Arth-Goldau to Luzern. These trains are jointly operated by the BT, SBB and SOB. To this end, a company was founded with the remit to market this train as a quality product. The trains are composed of the so-

called Revvivo cars to a uniform design. These are refurbished cars of the type EW 1 and are equipped with a new interior, air conditioning and new bogies. These BT trains have a yearly performance of 1.6 million kilometres.

The BT has a work force of around 250. It is therefore to a great extent vertically integrated in the performance of all the railway requirements such as station service, train service, maintenance and construction.

The BT has the legal form of a limited company, the form that is customary in Switzerland. The public authorities (Confederation, Cantons and Municipalities) hold 97 percent of the share capital. The remaining three percent are in private hands.

The BT has always been an innovative enterprise. This pioneer spirit has survived to this day. Examples:

- The Be 4/4 was the first electric main line locomotive without a carrying axle

- Re 4/4 was the first three-phase locomotive in the world (now standard).

The 65 km long BT line was built in just $4^{1/2}$ years. This is all the more remarkable, as the alignment proved to be very exacting. The topography was a challenge to engineering science in more ways than one. 91 bridges and 16 tunnels can be counted along the line. In fact engineering structures form 18 percent of the whole line length.

The most outstanding construction is the Sitter viaduct. It is 365m long, and with a height of 99 metres, is the highest railway bridge in Switzerland. The centre part in structural steel work is 120m long and weighs around 1000 tonnes.

CONSTRUCTION HISTORY

I should now like to focus my paper on the construction activity of the BT.

Of all the construction objects, extremely clear and detailed construction plans were drawn up in 1910. Today, these are carefully kept in the archives and they are of inestimable value for maintenance and renewal works. At the time, new standards were established in some areas for the construction of the BT. According to these, the following construction forms were chosen:

a) Tunnels:

Following the standard driving mining method, the linings were mostly finished with massive stone vaults.

b) Bridges/viaducts:

The vast majority of the bridges and viaducts were built in harmonic stone vault constructions. At critical places in regard to static stress, steel framework construction was used (Galgentobel, Waidacker, Sittertobel).

c) Track bed structure (track, ballast bed)

In the original track bed design, rails with a metre weight of 36 kg were chosen. Steel sleepers were used on the open line, and wooden sleepers in tunnels. For the track bed, round ballast supplied by domestic gravel works was used. This answered the requirements of the day.

d) Building construction

The building constructions (or station buildings) were aligned to the character of the respective regions. In the lower part of the line, the half timber construction typical for the Thurgau was used. In the middle part of the line, the post-and-beam construction, a feature of the Toggenburg valley style, was used. And in the upper part, the style of the factory owners houses was imitated. Even the gatekeepers lodges were built in the local style.

During the first 21 years, steam traction was used. Steam locomotives were specifically designed and procured for the line between Romanshorn and Rapperswil. In 1931, the BT was electrified. Dynamic stresses on tracks and rails remained practically the same, so that except for some extensions of the structural gauge for the overhead wire, no fundamental reinforcements on structures and tracks had to be made.

MAINTENANCE AND RENEWAL

Although the BT was carefully planned and built in 1910, with an excellent layout, the higher line utilisation and the ravages of time took their toll on the constructions, and particularly on the track. After 50 years of service, the installations had reached the end of their normal useful life, and in some cases had overrun it by far.

The technical standard in track construction, and the line load of the BT as from the early 1960s called for rails with a metre weight of 46 kg (profile SBB 1). For welded track, new sleepers and high-strength rail fastenings were necessary. Embedding the track ladder into a homogeneous ballast bed is a basic precondition for holding the welded track safely in place. The execution of the works under operating conditions was a special challenge for all concerned. This renewal and strengthening of the track bed was finished after 20 years of busy construction. The mainline track between Romanshorn and Wattwil was continuously and completely welded.

Over the past 20 years, no major track renewals have proved necessary. Instead, it was a question of taking care of the track and maintaining it (mechanical tamping, rail grinding and burr removing, maintenance of the insulated rail joints and of the welds of rail joints, renovation of switches). For a better fastening of the rails to the steel sleepers, reconditioned steel sleepers with grooved base plates welded onto them were set in place. In a few years, it will again be time to begin with the total renewal of various line sectors.

BRIDGES & VIADUCTS

Concurrently with the maintenance of the tracks, the structures such as bridges, stone vault viaducts and tunnels had to be maintained. The works for consolidation and reinforcing of the Sitter viaduct, lasting from 1964 to 1981, were among the more demanding undertaken.

- Construction of a ballast trough with water insulation above the stone vault viaduct
- Pillar IV: replacement of the outer defective masonry by concrete
- Pillar VI: securing by way of reinforced concrete
- Pillars II, III and V: casing with concrete
- Replacement of the defective masonry and vault segments at the viaduct vaults
- Reinforcement of the steel construction according to UIC standard load
- New painting of the steel construction

Between 1950 and 1965, reinforced concrete plates were built below the track beds of nine stone vault viaducts. Thus, a bond action was achieved which gave the stone vaults a considerably improved stability. At that time a water insulation was not yet built in. As from 1996, concrete troughs with water insulation were built in at twelve stone vault viaducts.

TUNNELS

Also as regards tunnels it can be said that the construction methods applied in the years 1907 to 1910 were adequate and of good quality. Electric traction with extended structural gauge for the catenary however required track lowering over long tunnel sectors, and insulation against water seepage into the structure. Also the tunnel drainage had to be lowered in part and renewed. In the Bruggwald tunnel, an inverted arch had to be built over a length of 500 metres. To enable operation to continue, special construction methods had to be developed. The tunnel renovations were for the most part finished by 1980.

SAFETY INSTALLATIONS AND CATENARY

Concurrent with the track renewals starting in the early 1960s, the safety installations and the catenary were renewed and modernised on the whole line. With this, a degree of rationalisation in operations management could be achieved which was the maximum possible at that time. From the remote-control centres in Wittenbach and Herisau, the corresponding line sectors can be centrally controlled.

BT Re 4/4 456 094 departs Luzern with the 1345 to Romanshorn. 9/9/00 Photo: Chris Milner

FUTURE DEVELOPMENT WORKS

Today, the BT's main activity concerns passenger traffic. With roughly 6.5 million passenger trips per year, it is a major operator in the suburban traffic of the city of St Gallen. Together with SBB, with the Appenzeller Bahnen, and the local bus operators, the level of service of public transport in St Gallen can be termed as exemplary.

However since the foundation of the BT, it radiated and strived to extend its activity to beyond the St Gallen area. In partnership with SBB and the Südostbahn, train operation extends to Luzern in the heart of Switzerland. The upgrading of the corresponding line sector between St Gallen and Arth-Goldau, and particularly the planned double-track sector at Degersheim, but also other extensions, will keep us very busy in the coming two to three years.

In a vote on the construction and financing of public transport infrastructure - the Swiss democracy allows for such co-determination - the Swiss population has clearly acknowledged the need for a future-oriented and performing rail network. With this, Switzerland laid the financial foundation for four major railway projects. These are Rail 2000, AlpTransit, the connection of Switzerland to the European high-speed network, and noise abatement measures.

The two new transalpine corridors planned at the Gotthard and the Lötschberg will be key connections and the most important elements of the European north-south axis. The Gotthard project includes also the access route from Eastern Switzerland. This access to the transalpine Gotthard line, and the integration into the Rail 2000 scheme is of utmost importance for our region. With the entry into service of the Gotthard base tunnel, travel times between St.Gallen and Lugano will be cut to $2^{3/4}$ hours, from today's 4 hours. The whole economy benefits from efficient public transport, which incidentally is also an important employment provider. It is therefore a question of the welfare of the whole population.

There are no high-performance roads in our hilly region. The most comfortable, but also the fastest transport is provided by the railway. The BT intends to turn this geographical advantage to benefit. This however is only pos-

sible with a modern and efficient service. For attractive train services, high performing infrastructure is required. Extensions are urgently needed in order that the BT can assume its bridge function - in the truest sense of the word - also, in the future.

We are very glad that one of the projects of the line upgrading between St Gallen and Arth Goldau can be started shortly and that the quality of the "Voralpen Express" can thus be significantly enhanced.

PROJECTS TO BE REALISED IN THE NEAR FUTURE

~Upgrading of the railway line St.Gallen-Rapperswil-Arth Goldau

~Voralpen-Express

Why do we need an improved Voralpen-Express? The Voralpen-Express is the shortest connection between Eastern and Central Switzerland and the Ticino. At many places, the line has links to other parts of the railway network. Train connections are well coordinated with each other. We wish to upgrade the Voralpen-Express to improve this attractive connection even more. This will be achieved by modernising infrastructure and the removal of capacity bottlenecks.

Line upgrading is done in two stages. In the first stage, the most critical objects are modernised. They are briefly presented here.

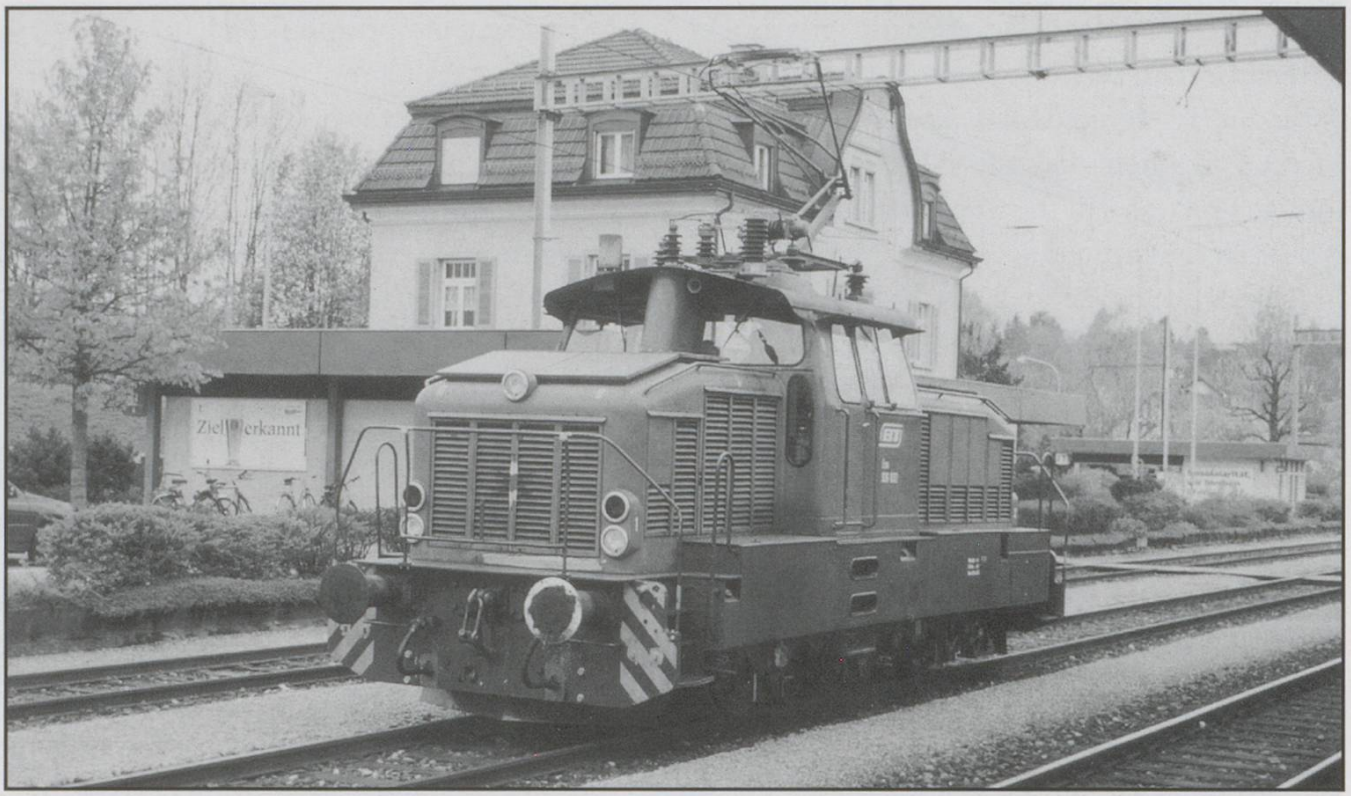
What are the individual improvement measures?

- Stabilisation of the timetable
- Elimination of delays
- Increase in operational flexibility
- Shortening of travel times
- Safety increase
- Optimisation of interchange facilities
- Line capacity increase
- Ensuring connections in Arth Goldau (new timetable concept SBB)
- Relief of SBB trunk lines and the Zürich area
- Replacement of old safety installations
- Increase of performance capacity
- Cutting of operating costs
- Project realisation according to priorities
- Making investments that are appropriate in regard to managerial and national economy
- Promotion of regional centres and contributing to the relieving of population pressure on major conurbations
- Reaping a highest-possible benefit from as low as possible investments

Where do we want to modernise?

1. St.Gallen: station throat upgrading on the line to Haggen. Remove the need for trains having to wait in stations to cross.
2. Degersheim: double-track sector on the line to Mogelsberg The half-hourly train crossings are always made here. Crossing point transfers today are possible only if the delays are longer than 10 minutes.
3. Lichtensteig: new signal box. Increased safety, lowering operating costs.
4. Lichtensteig-Wattwil: two-way working. Increased operational flexibility and timetable stability.
5. Wattwil: new signal box and modernised platform layout (track-free access). Increased safety. Customer-friendly installations. Lowering operating costs.
6. Uznach: new signal box and modernised platform layout (track-free access). Increased safety. Simultaneous train arrivals and departures. Customer-friendly installations. Lowering of operating costs.
7. Pfäffikon SZ: extension of entry and exit yard area. Remove the need for trains having to wait in the station to cross. The most heavily used single-track line of Switzerland will, at least on part of its length, become a double track line.

With the upgrade, we are able to significantly improve the quality of our core business, passenger traffic. The BT thus comes a substantial step closer to its strategic goal, namely to remain a leading passenger services supplier in Eastern Switzerland.



The BT has faith in its future, because its strong points are:

- A motivated workforce
- Flexibility and short decision processes
- Readiness to innovate
- Line layout with competitive travel times
- Well-established in the region
- Modern and customer-friendly trains
- Good offers at good prices
- Rational production.

CONCLUSION

Well, ladies and gentlemen, you can see that the BT is well on track to the future. It is an active player in the Swiss transport industry and thereby fulfils its mandate in the service and for the good of the whole of Eastern Switzerland.

Two views reminding one that the BT is a normal working railway as well as a brand leader.
***ABOVE:** Tm 2/2 102 shunts at St Gallen Haagen and **LEFT:** BDe 53 forms the 1024 to Uznach at St Gallen.*
Both pictures taken in May 1998 by the Editor