KRAFT MUSEET

Information

The Administration Building

The hydropower company, Tyssefaldene Ltd. Had their administration offices here. Built in 1914, architects beeing Morgenstierne and Eide, a leading company in Norwegian architecture. In the upper floors there were apartments, in the basement a bank, a post office (The sign can still be seen above the window at the far left on the ground floor) as well as a telegraph. Tyssefaldene had police authority until 1915, and there was a jail at the back of the basement floor. The hydropower company was located here until 1989.

About Tyssedal

In the years before 1900 inhabitants of Odda and Tyssedal were living off agriculture. Some were able to earn extra when tourism expanded. Odda was one of the first tourist resorts in the country, the main attractions being the waterfalls, glacier, fjord, mountains and the wild nature in Tyssedal and Skjeggedal. In 1904 half of all the tourists coming to Norway, came to visit the Odda-area.

Thirty people lived on two farms in Tyssedal (1905) before the industrialization reached this smal crack in the mountain. With the construction of the powerstation, a new era began, transforming the area into a modern industrial society. Due to the construction work there was a lot of emigration into the area (and the local emigration to the USA decreased). In the course of just a few years, several hundred people settled in and around Tyssedal (1920: 1124 inhabitants). They came from all over Norway, as well as from Sweden. This has given Tyssedal a special dialect, and there are still many Swedish surnames in the area.

The powerstation Tysso I, was constructed at the same time as the worlds largest carbide factory (The Sun Gas Company) was built on the plain fields in Odda. The industry created jobs causing the basis of the new society in Tyssedal and Odda. However, as the industry grew, the tourists disappeared. The outbrake of the first world war in 1914 was more or less the end of the tourist era for many years.

The main reason for developing hydropower in Tyssedal, was the rich waterfalls (Tyssestrengene 312 m and Ringedalsfossen 300 m) coming from the nearby mountain plateau Hardangervidda. Combined with the deep, icefree Sørfjord, this made it possible to establish a profitable industry in the area. However, despite of having the technology of being able to produce hydropower, the technology of being able to transport the electricity over greater distances was not yet fully developed.

Consequently, (electrochemical/ electrometallurgical) industry had to be built close to the deliverance of electricity. There were no sites suitable for a carbide factory in Tyssedal, which was the reason for building it on the plain fields in Odda. A good harbour had also to be built for import/ export.

Architecture

In the wake of the great immigration caused by the hydro electric power development, vast construction works were needed. Tyssefaldene did most of this. With great architectural tasks involved, several of the leading architects and town planners in the country participated. This architecture is still seen in Tyssedal, and is characteristic of several of the early industrial towns in Norway. From the museum you can see the hotel where the English and French industrial pioneers made their decisions. You can also see "Festiviteten", a house which was used for dancing on saturdays and church services on sundays.

Tyssefaldene wanted reliable workers and let them rent houses for a small amount of money. From 1913 the households got cheap electricity. The company also built some of the first garden homes in Norway, to secure the workers having "harmonious green surroundings to rest their eyes on, making them more efficient workers."

Oksla

Oksla power station was built in march 1980, and started its production in september 1980. The actual station is situated 800 meters inside the mountain, which is favourable regarding the transport of water, but also for environmental and security reasons. In Oksla power station there is just one aggregate with one turbine, while there were 15 in the old building. Still 2.5 times more power is produced in the modern station. Local industry and householdings consume most of the produced electricity. Some is connected to the National grid, which happened as late as 1967. Today Tyssefaldene/Statkraft produces about 2% of the total power production in Norway. Approx. 98% of norwegian electricity hydropower related.

Intake tunnel and penstock.

The intake tunnel and the first two penstocks were constructed from 1906- 08 and was a pioneer project in Scandinavia. The tunnel in the mountainside is 3.5 km long and leads the water from the lake Vetlevatn in Skjeggedal to the collecting reservoir in Lilletopp. It was partly drilled by hand, and the tunnel masses were also removed by hand. The penstock has a free fall of 400 m and is over 700m long. During the construction, the workers had an electric funicular helping them get the massive pieces of iron up the steep mountainside, but beyond that, everything was done by hand. The only security the workers would have, was a rope tied around their waist, tying them to one another. The next two penstocks came in 1912, and the fifth in 1915.

In 1980 there was a pipeburst on pipe number three, up on 300 meters. Enormous amounts of water poured down the mountain side. From then on, the four oldest pipes were put out of use. The last one was in operation until 1989.

Since then, no hydropower electricity has been produced in the old station. However, two converters were running until 1996.

When the power plant Tysso II was completed in 1967 up in Skjeggedal, Odda and Tyssedal became a part of the national grid, and a transition was made to 50 Hz electricity. This meant that all electric appliances had to be rebuilt or replaced. Tysso I continued to deliver 25Hz electricity to the smelting plant in Odda. Therefore aggregate 1 and 2 were turned into converters so that the smelting plant got the correct frequency electricity. The converters were in use until 1996.

From 1996 to 2003 the factory in Odda had their own converters.

The old powerstation - Tysso I

Tyssefaldene Ltd. Was established after the Eyde concern had signed a contract with The Sun Gas Company to deliver power to the new factory in Odda. The plan was to build the world's largest carbide factory, which was dependent on huge amounts of electricity - both while building it and not at least during production. The construction of the power station started in 1906, and was ready to deliver electricity in 1908. Sam Eyde was the managing director. In 1910 Rangvald Blakstad took over. Blakstad expanded the power station and built the dam in Skjeggedal. In 1918 the station was nearly the way it is today. 15 aggregates made it one of the largest in Europe at the time, with an annual production of approx. 700 Gwh.

Exterior

Two of the most prominent norwegian architects, Thorvald Astrup and Victor Nordan, collaborated in designing the building. Their idea was to make industrial buildings aesthetic as well as functional. The result was a prestige building representing a symbol of the new industrial era.

Interior

The interior of the building is also richly decorated. You may notice the beautiful details as the ornamentation on lighting and banisters, and around the clock on the south wall. The painted decoration was found under nine different layers of painting once the restauration work started in 2000.

Apart from the converters in the south part of the turbine hall, the interior is today nearly the same as in 1918. Only single machine parts have been replaced over the years. The turbine hall is probably the most authentic of all Norwegian first generation power stations.

Electricity deliverance

The water is collected in reservoirs in the mountains of Hardangervidda. With an intense speed, it runs through tunnel and the penstock towards the turbines situated in the station. The water turns the turbine wheel, and mechanical energy occurs. The turbine is connected with a generator, making electrical energy.

The power is transported to the electricity network. Some of it is delivered further on to the National grid covering different parts of the country. In order to get high voltage, magnetism must be supplied.

This power station produced solely 25 kHz electricity. The reason was that the cilns of the carbide factory needed this frequenzy. The eye is able to perceive the oscillations in alternating current of this frequency, so it looked like the light flickered.

The "snobs" were converters transforming the current from 25 to 50 Herz. They supplied electricity to the cranes running along the ceiling in the power station. The directors also had this current delivered to the hotel and to the managers' houses. They were the only people getting this "better" electricity for lighting and heating. The converters were soon called "the snobs" (in addition to that, they were actually named "Snabbare" – which is Swedish for faster).

Work

The 1st and the 2nd engineer had their daily work in the turbine hall.

The third engineer was controlling the instrumentboard, responsible for the control room.

Originally the panel was a balcony above the machine hall. To expand the control panel and reduce the noise problem, the panel was moved behind a glass wall as we see it today. The board watch was regulating the voltage of the machines while listening to them to see that everything was running smoothly in the production hall. The machines were extremely loud when running at full speed, and hearing protection was not in use. In 1942, the control room was expanded to a room behind the wall. Due to ww2 it was not possible to get was the reason for not providing new instruments for the panels. This we can appreciate today, as we now have the best kept 1st generation control panel worldwide.

In addition to the workers, two people were employed to keep everything clean. It was important to keep dirt from clogging up the machinery. There were many brass and copper details, and everything had to be polished. When they had cleaned the whole station, they started over again. This way, every machine was thoroughly cleaned every 14 days.

The cranes can be moved all the way through the power station, and were used for lifting off the machine cover/ parts for maintenance and cleaning, and of course to get the aggregates in place when they were delivered by ship in the north part of the station.

The control room

Everything on the back wall is the original control panels from 1906- 18, one of them in use until 1989. The instruments are mounted on 45 mm thick marble slabs; these are beautiful, practical, and safe; as they do not conduct electricity. Each aggregate in the station had its own separate marble slab. There were separate control panels for converters and magnetizing machines. The synchronization device was delivered in 1911 and was in operation until 1989. It was crucial in order to coordinate aggregates to the grid.

In the late 1950s the area experienced a draught, and the power company came very near to being unable to supply the necessary electricity to the factories. Consequently it was considered a lot safer to get hooked up to the National electricity grid. The grid was 50 kHz, however, so changes had to be made. In 1967 the power station was ready to be connected to the grid.

In connection with this two additional control panels were installed, the tinplate ones in the middle of the room - left and right - controlling other power stations and transformators from here. In 1980 the new power station Oksla, was controlled from the far right side of this panel. The smaller wooden desk was added in the 1980ies, giving the engineer a telephone central.

From 1987, the operation of the new power station was controlled by computers. In 1993, being the first power station in Europe, Tyssefaldene implemented satellite communication to control opening and closing of the water reservoirs in Hardangervidda.

Today the main control central is situated on the other side of the mountain in the small town Sauda.

The environment

The industrialization of Tyssedal and Odda has not only been positive. The area has been exposed to a lot of pollution. Heavy metals such as mercury, cadmium, lead, zinc and copper were for many years dumped directly on to the fjord. The result was that Sørfjorden, which once was a tourist attraction because of its scenery, was regarded as one of the most polluted fjords in the world. On windy days, the Fjord would often turn from blue to a rusty red.

From the 1980ies, much has been done to improve the situation. The factories have implemented new purification technology and recycling. As an example, Norzink/Boliden has invested about 600 mill. NOK to reduce polluting discharges with 99.5%. From being one of the main environmental polluters, Norzink is today a pioneer in many areas. As from 1986 they have built great rock blasted waste pits for disposal of heavy metal discharge. Moreover, the former waste dumps in the Eitrheims bay have been isolated.

A sheet pile wall is rammed down in the seabed, and the seabed outside the wall is covered with fibre pad and shell sand down to ten meters sea depth. On dry land, the dumps are covered with soil, and now grass and plants are growing there.

TIZIR

There has been industry in Tyssedal since 1916, but Tizir Titan & Iron was established in 1984. Tizir produces iron and slag containing titanium. The raw material is ilmenite coming from Senegal, where Tizir has their own mines.

From the Titan dioxide slag a pigment is made which is used in all products needing white colour as plastic, paper, toothpaste and many other items.

The iron ilmenite is used for car parts and motor parts of windturbines.

Odda Smelteverk

The factory was taken over by BOC (British Oxygen Company) in 1924, continuing producing calcium carbide. Carbide was much used for lighting in british mines, giving an intense white light. Later the main usage was for welding. As a component of acetylene gas, it was used as a raw material in artificial silk, plastic and medicine. Another product out of carbide is dicyandiamide which was used in fertilizers, electronic industry, colour binding in textiles and explosives. The factory closed in 2003.

Norzink/Boliden

Norzink is the only zinc factory in Scandinavia, and was established in 1924 - 1929. Today the company is owned by swedish Boliden. Norzink gets raw materials from Norway, Sweden, Europe and North and South America.

The zinc is mainly used for protecting steel against rust and corrosion by galvanization. Main customer countries are Germany and England.

The Multimedia show *"The Industrial Adventure"*

The show depicts the growth of modern Norway seen through the examples of Tyssedal and Odda. It shows the background of the great hydro power development, the ideas of the industrial pioneers, and the fantastic effort of the migrant workers. There are also interviews with people witnessing it.

The multimedia show is produced by ethnologist Randi Storaas. It is built up of old (including Knud Knudsen 1832-1915, and Anders Beer Wilse) and new photos. Duration 27 minutes.

It is also possible to see the film *Industrial pioneers.* Please let the host in the recception know if you wish to see this second film.

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