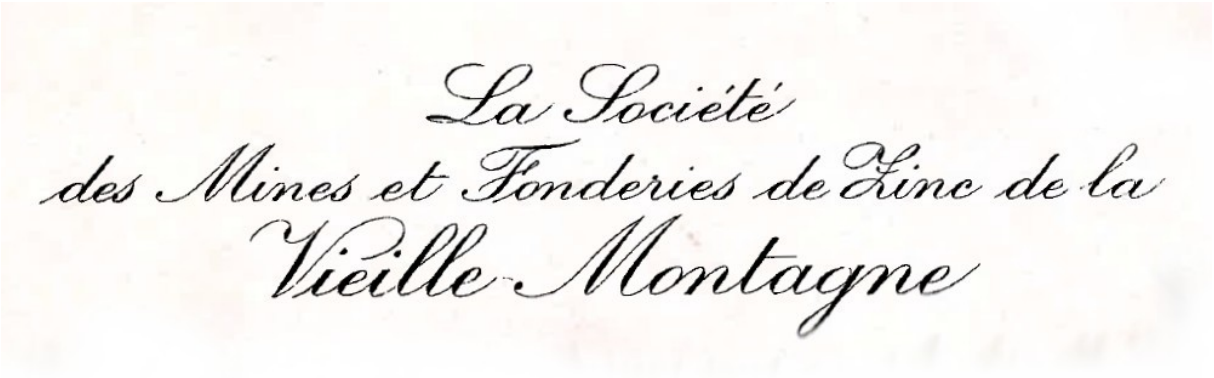


Zinc smelter Balen, België.

1889 -

François Wouters 2018.

1889 VM-Balen, from zink ore roaster and lead smelter to zinc smelter.

At the end of 1888, Vieille-Montagne purchased a terrain of 365 hectares on the borders of Balen, Mol and Lommel. The factory in Balen (then Baelen) was built in 1889 on the sandy grounds of the Campine. Ideally located at the intersection of the Antwerp-München-Gladbach railway and a branch of the "Kempens" Canal that connected Antwerp, the port of entry for the ores, and Liège, the final destination of the roasted ores. The factory itself was built by Gustave Ross, a German engineer, who used his knowledge in the Vieille-Montagne roasting plant in Oberhausen to develop a roasting unit for zinc blende in Balen. At the beginning there were 20 hand-operated roast furnaces for blende that released their gasses in the open air with a catastrophic effect on the environment.

1908 New roasting plant Vieille-Montagne in Balen.

The zinc industry in Liège originated in Moresnet in the early nineteenth century. In the Moresnet area you found the Altenberg (Vieille-Montagne) zinc mine in Kelmis (La Calamine). The zinc ore calamine was a mix of smithsonite, hemimorphite and willemite. Zinc was recovered from roasted calamine by reduction. After 1860, when the Altenberg mine was exhausted, the production of calamine in Belgium fell sharply and Vieille-Montagne was forced to switch to zinc sulphide. Zinc sulphide, also called blende, was found in the mines in the Moresnet concession. VM also owned an important mine for zinc blende in Sweden. Both the calamine and the blende had to be roasted before they could be processed into zinc in the reduction kilns. At that time, zinc was produced exclusively by reduction.

During the process of roasting zinc sulphide, sulfuric fumes are released, which heavily pollute the environment. For environmental reasons Vieille-Montagne started looking for a sparsely populated area. This was found in Belgium in the Antwerp Campine on the border with Limburg. Here they bought a site of more than 387 Ha. The plant installations covered about 9 hectares.

At that time there was already roasting in Flône, Oberhausen and Ammeberg. But the production capacity turned out to be insufficient and that's why they chose to build a fourth roasting unit in Balen.

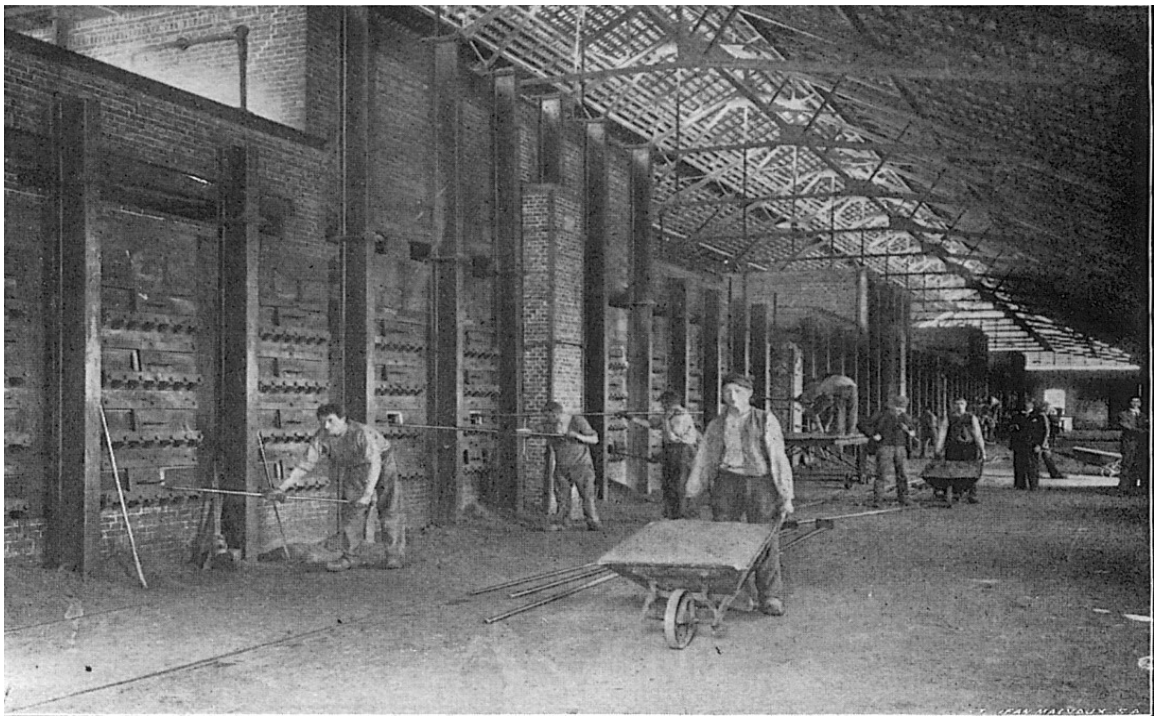
The social aspect.

As at all settlements of Vieille-Montagne, housing was provided for the employees. VM built homes for the director and engineers, employees and workers, a casino with accommodation, a hospital, a church and a railway station. VM has built at least 400 homes during the first three decades. A new community grew side by side with the factory. This new community was called Balen-Wezel. Attempts were made to make this a new independent municipality, but these plans did not go through.

The factory start on 1 October 1890.

On January 11, 1891 a young engineer Joseph Bellefroid takes over the factory and remains director until his death in 1935. He will expand the site in an impressive way.

On October 1, 1890 the factory starts with 20 reverberation furnaces for blende with each 2 or more roasting floors. The ores are roasted at almost 1.000 °C. The roasted blende, calcine, is moved manually from one heart floor to another by means of iron hooks.



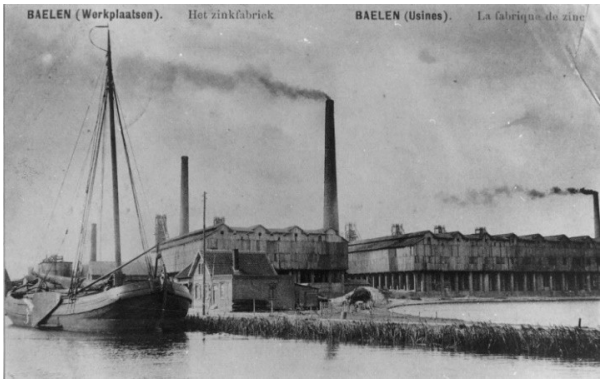
Hall 1 starts with 20 reverberation furnaces for blende with each 2 or more roasting floors.

Already in 1896 a second hall was built and 16 new furnaces were added. There is constantly being added, a third, fourth, fifth hall, until the first world war, to a total of 90 furnaces.

From 1893 the demand for sulfuric acid increased and it became economically viable to process the SO_2 gases from the roasting furnaces. They proceeded to produce sulfuric acid through the "Lead chamber process".

1898 Flue gas purification through "Lead chambers."

In 1998, 6 lead-chambers were built for the production of sulfuric acid, another 4 were added in 1901.



12 “lead-chambers” as gas cleaning.

In 1890 at the start of the roasting plant, the capacity was 36.000 tons per year. (still no sulfuric acid production)

In 1898 this amounted to 75.000 tons of roasted blende (calcine) and it was possible to produce 60,000 tons of sulfuric acid by means of the lead-chambers.

In 1911, 120.000 tons of raw blende were roasted and 90.000 tons of sulfuric acid were produced.

Later, the lead chamber process is gradually replaced by a "contact process" in which the conversion of SO_2-gas to SO_3 is carried out via catalysis, usually Vanadium pentoxide. The first "contact" is being built in 1909.

1913 Switching roaster furnaces with manual operation to automatic Spirlets.

From 1913 onwards, the labour-intensive manual operated roasting of zinc blende is gradually being replaced by Spirlets. These are furnaces with rotating floors that make the heavy manual labour superfluous. Systematically the 33 automatic furnaces of the Spirlet type will come into service.

The enormous hall with 33 Spirlet blende roasters.

I would like to make the remark that until then VM-Balen was only a roasting facility for zinc ores intended for the reduction kilns in Liege. Until then no zinc was produced in Balen. besides the roasting of zinc blende in 1909 a lead factory was commissioned.

Vieille-Montagne won large quantities of silver-containing lead ore from its own mines. The residual ash from the zinc reduction kilns in Liège also still contains many metal residues such as lead, silver and copper and lends itself perfectly as an additional raw material for the lead furnaces.

In 1909, a lead factory was set up with 2 water-jacket blast furnaces for 31.000 tons of lead per year. These two ovens were replaced in 1958 by 1 new larger one with a capacity of 110 to 150 tons of lead per day, which will continue to be in service until 1976 when the lead factory closes.

Lead blast furnaces, filling lead moulds.

1922 Construction of a lead rolling mill.

In 1922 a lead rolling mill was set up with an annual capacity of 6.000 tons.
The installation has a large lead roller for sheet lead and a lead press for pipe moulding.

1922 Lead rolling mill and pipe moulding.

1932 Slag reduction furnace for the recovery of zinc oxide. Cubilot.

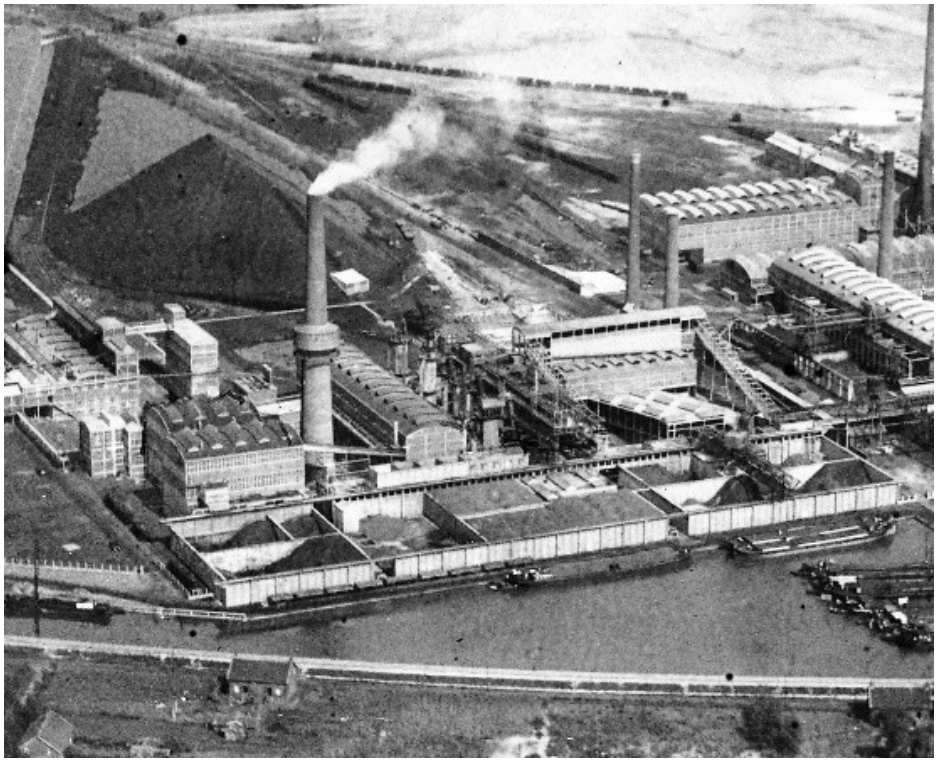
Since the commissioning of the lead factory, the melting of sintered lead ores, a huge mountain of zinc-bearing slag was created. For the processing of the zinc-bearing metal slag mountain that had meanwhile assumed enormous proportions, 300.000 tons, it was decided to build a slag reduction furnace. A Cubilot furnace. This reduction furnace recuperated the zinc oxide from the slag. This zinc oxide is precipitated as powder from the flue gases and dissolved in diluted sulfuric acid through a mixing tub and pumped to the zinc leach plant.

This department had a capacity in 1932 to process 52.000 tonnes of zinc-containing metal slag per year. It will clean up the impressive lead slag mountain.

1932 Construction of a power plant.

In this process of slag reduction in the Cubilots, combustible gas was formed. In order to process this gas, a power plant was built that converted these combustible gases into electricity by means of steam boilers. This free electric power was then used to supply a new zinc electrolysis.
A win-win situation.

In 1932 this power plant produced 296.200.000 kWh.



On the left the power plant, on the right the Cubilots, in the back the slag heap.

1934 The first zinc electrolysis; Hall 1 to 4.

First zinc electrolyses, Hall 1 to 4.

In 1934, with the construction of the electrolysis, a new era was started. Because Vieille-Montagne already built an electrolysis in Viviez in 1922, they had sufficient knowledge to apply this in Balen.

The inside of the first electrolyses in Balen.

1935 From now on Vieille-Montagne Balen became a "zinc producer”.

The capacity of the zinc electrolysis will continue to grow from then on. Not only by the use of the zinc oxides from the Cubilots but also by the use of roasted blende, calcine. Together with the capacity of the electrolysis, that of the roasting will also grow.

When later the zinc production with reduction kilns around Liege was stopped, all roasted ores will be used in Balen. Balen is now fully supplying itself with blende from abroad and is starting to produce zinc independently.

1967 An aerial view, notice the electrolyse hall 1-4 on the right, hall 14 on the left.

The site grows into a huge industrial complex. The aerial photograph around 1967 shows the factory before the closure of the lead factory and Cubilots. At the time there were 1800 men at work.
The own research services further developed the hydrometallurgical method. The factory will now be converted into an RLE plant. Roast-Leach Electrolyses. The Cubilots and lead furnace are closed and the roasted zin blende is dissolved in diluted sulfuric acid in newly build leach plant. By electrolysis 99,995% pure zinc is precipitated on cathodes and subsequently melted into lingots. A complete turnaround.

In the mid-seventies, the factory takes on a whole different shape. Departments such as the lead factory and the Cubilots are closed and are demolished, they completely disappear.

A new factory is emerging. A new leach plant is being built, roasting is being stepped up and the zinc electrolysis is being expanded.

The RLE-plant grows.

With the inventive engineer Jean Andre, the roasting in Balen experienced an enormous development. Experiments were done with flash roasting and in he built the first experimental fluid-bed roaster for zinc.

Experimental version of the fluid-bed roaster.

Jean Andre was director from 1970 to 1979. He later became managing director of VM.

The 33 Spirlets were gradually replaced by fluid-bed roasters.

In 1958, the first fluid-bed roaster for zinc ore was built in Balen, capacity 65 tons per day. Later this first roaster was rebuilt and upgraded to 130 tons.

In 1964 another 2 roasters of 130 tons were built, in 1965 a larger one of 350 tons: "Fluo 4" and in 1986 the largest in the world: "Fluo 5", good for 850 tons/day. The latter 2 are currently still in service and now, under Nyrstar, are processing 480 and 1075 tons/day respectively.

1986 Fluo 5 the largest fluid-bed roaster.

Of course, the development of the rest of the factory did not stand still either.
The leach plant and zinc electrolysis also grew in proportion.

Electrolysis was constantly being expanded and modernized, and automated. The last major renovation was done in 1979 by the construction of the Super-Jumbo zinc halls. Capacity 120.000 tons per year. Thanks to several modifications, this electrolysis hall can now produce 270.000 tonnes of 99,995% pure zinc per year.

Super-Jumbo zinc electrolyse in Balen still at work.

Due to the switch to the RLE method and the continuous improvements, production has tripled since the 1970s and in the meantime the number of employees under Nyrstar has dropped to 560 people.

1989 End of "Vieille-Montagne". Balen comes under Union Minière.

In 1989 Union Minière takes over Vieille-Montagne, Mechim and MHO (Métallurgi-Hoboken-Overpelt) and forms one group. This ends “Vieille-Montagne”. The offices of the VM management in Angleur are closed and the management is transferred to the headquarters of Union Minière in Woluwe.

In 2007 the Balen smelter is integrated into the Nyrstar group.

Despite all acquisitions takeovers and name changes, Balen is still an active and highly performing zinc smelter. But it is becoming increasingly difficult to keep such a factory going in Belgium.

The zinc plant in Balen now, cleaned up, still good for 270.000 ton zinc per year.

Stricter environmental standards, high energy costs, high wages, the disappearance of the car industry, all this doesn’t make it any easier. In addition, Nyrstar owns 2 large and 1 small smelter in Western Europe. The Budel smelter, with the same capacity, is located only 35 km from Balen and is fishes in the same pond.

François Wouters 2018