Treasures of the Diamond Coast. A Century of Diamond Mining in Namibia

Author: Gabi Schneider
Macmillan Education Namibia Publishers
Windhoek, 2009
ISBN 9789991609683
Hardcover, 25x33 cm, 320 pages, throughout illustrations and photos

Chapter 22: Elizabeth Bay

Diamondeferous grits

So far, I have always been confined to piecemeal work, but now we cow at long last build a unified whole!
Hans Hörlein, General Manager, CDM, 1923

At Elizabeth Bay, CDM continued to mine the deposit previously worked on a small scale to go ahead with constructing the envisaged mine by the Koloniale Bergbau-Gesellschaft. The deposit comprised 1 to 4m unconsolidated diamond-bearing sands and gravels, underlain by some 2 m of cemented, diamond-bearing conglomerates and covered by some 2 to 3 m of aeolian sand. With an average grade of 2 carats per cubic metre, and five stones to the carat, 1 cubic m of sediment basically contained only one diamond. This made Elizabeth Bay a very low-grade deposit. However, since the the deposits were mined out in the early days, this grade represented the average grade of Bogenfels in in the 1920s (Bürg 1942). It soon became clear that because of this low grade a profitable diamond-mining operation would have to excavate excavate huge amounts of sediments in a large open pit

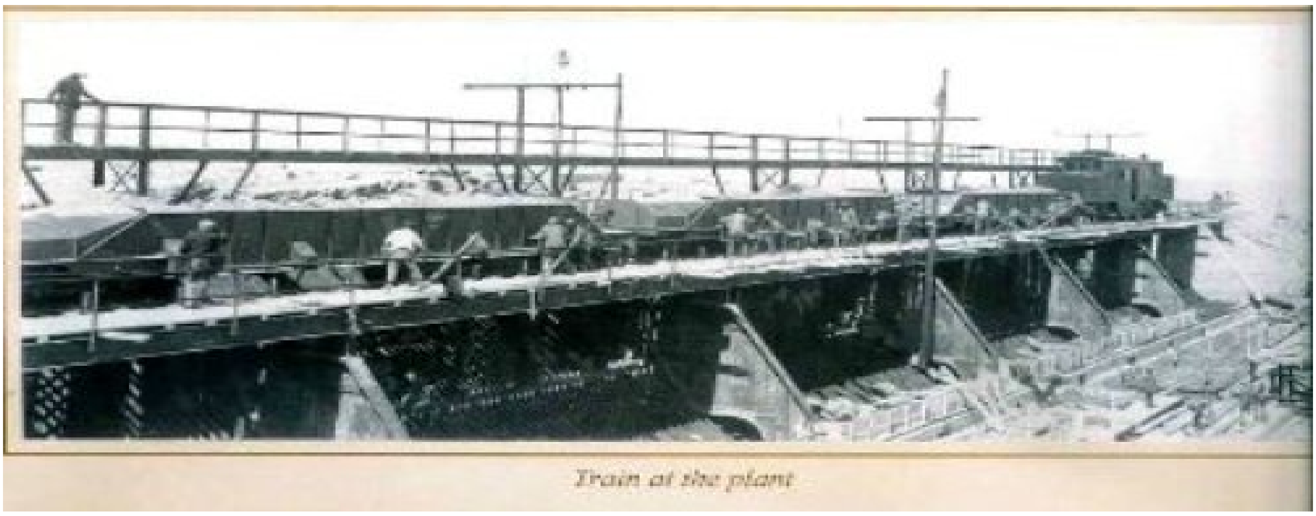
using heavy mining equipment, and that these sediments would have to be treated in a large, central plant.

Mining would have to be conducted on three levels: first, the hanging all, comprising the aeolian sands covering the deposit; second, the unconsolidated diamond-bearing sands and gravels; and third, the cemented, diamond-bearing conglomerates. But as the consequences of the 1920-1921 depression were still looming on the horizon,it took general manager Hörlein until 1923 before he received the permission and funds to go ahead with constructing the envisaged mine and central plant. He immediately undertook a study trip to the United States where he looked at a number of operations. The ground-breaking ceremony for the new Elizabeth Bay plant took place soon thereafter, in February 1924. As the development of the new mine between 1924 and 1927 coincided with a period of flourishing diamond markets, and mining in the other areas had to continue with some 8,000 workers stationed on the various diamond fields, this put extreme pressure and high demands on management.

Unloading the German cement for Elizabeth Bay

Hörlein recruited several engineers and technicians along with hundreds of artisans from Germany to build the new plant. All the material and every piece of equipment had to be transported by the state railways from Lüderitz to the magazine in Kolmanskuppe, from where it was sent by the company railways to Elizabeth Bay - all in all a distance of 44 km.

The railways, therefore, had to be in excellent condition. To avoid disruptions of the normal daily business of the operating diamond fields, a second railway line was laid for the supply of the Elizabeth Bay building operations. Smaller pieces of equipment were transported in a 3-t and a 7-t motor trolley, both having been built in the workshop at Kolmanskuppe, and new carriages with a capacity of 12-t were bought, together with water-tank carriages with a capacity of 10 t. Abnormally heavy loads were transported on a 24-t low-bed carriage. Unfortunately, because the gravel in the Elizabeth Bay area contained a lot of mica, it was unsuitable for the preparation of concrete. Suitable gravel had to be transported to the building site from a pit 10 km away. As major parts of the plant were built on the solid rocks that comprise the spit



Train at the plant

at Elizabeth Bay, much blasting had to be done for the foundations.

Menck & Hambrock electric shovel loading rail carriages

Due to Hörlein's perseverance, supplies and equipment were also almost exclusively overburden. The railway lines were designed in such a way that the shovels could fill the materials directly into the carriages and each shovel could be served by a separate train. The trains would proceed to the plant one behind the other under their power right up the main line. There they picked up a 400-V from overhead wires by means of pantographs, and made their way further.

In 1923 Hörlein approached Hannover Maschinenbau Aktiengesellschaft in Germany known as Hanomag, with the idea of a high-capacity gas-electric that could be used on live rail with overhead wires as well as non-electrified tracks as a self-contained transportation system. This latter ability was considered necessary to allow the locomotive to operate in the vicinity of shovels and in an environment were live overhead wires would have presented too great a hazard. Such a locomotive , although heavier, was to be similar to the '11' and to those found in Germany's many open-pit lignite mines. In time, Hörlein and Hanomag designed a unique locomotive that promised to perform excellently. Ten locomotive units in the new design were built by Hanomag and were fitted with electrical equipment built by the Siemens-Schuckert works of Berlin, giving the locomotives 850 hp. Benz of Mannheim manufactured the main-drive 220 hp benz engines and all the directly related auxiliaries. The 10-t locomotives were numbered from 19 to '40' and were commissioned around Elizabeth Bay. They had a 13,5 in traction power and pulled 16 cars weighing 21 t with a carrying capacity of 25 m³ or 40 t, giving a total tractive capacity of 1000-t. The carriages had brakes manufactured by Kuntze. Two additional 75-t electric/diesel-electric locomotives – numbered '21' and '22' and again built by Hanomag, Siemens-Schuck and Benz – also arrived in 1926. However, they were not exactly satisfactory and were sold to a mining concern in Johannesburg after only one year of service (Moir & Critten 1982).

The '33'

The year 1926 also saw the relocation of the main CDM railway line so that it passed through Elizabeth Bay. The line was built with 3-kg rails, each 12 m in length

Railway line at Elizabeth Bay

on wooden railway sleepers. The nature of the operations naturally required a constant shifting of the railways serving the various areas being mined, but the main line usually remained where it was for quite some time. The railway line had the form of a figure of eight, with the ore storage bunker of the plant on the one end and the mining face on the other. As the mining face progressed from west to east, the railway line was moved with the aid of two Demag cranes, also on crawler tracks. The benefit of this shape was that trains only had to move in one direction and would not meet, which was important in an area with regular fog and hence limited visibility. At the plant itself the main line was separated into two tracks, and three different coloured light signals directed the trains to the offloading areas. Trains with consolidated material dropped their loads via bunkers into the mills, while trains carrying unconsolidated material fed their loads directly to the sieves via conveyor belts. A large

Laying the railway line

locomotive shed was erected at the southern end of the railway line, and a small petrol depot for the refuelling of the locomotives was built close by. A small station building, hardly larger than an ordinary house, was erected between me petrol depot and the residential area. Four motor trolleys were used on the railway line. The smallest, Trolley No. 4, was a one man inspection vehicle powered by a DKW two-stroke engine. It was open to and nicknamed Nuckelpinne (old banger). The drivers of this piece of equipment had to wear windbreakers and safety goggles exposed to the ever-howling south-westerly winds. Trolley No. 1 was used for regular passenger transport between Kolmanskuppe and Elizabeth Bay on Tuesdays and Fridays. Trolley No 2, a little larger, was used for passengers and express goods, while Trolley no 3, the largest, had a enclosed cabin and could carry passengers and express goods up to 2 t in weight (Skillian 1992).

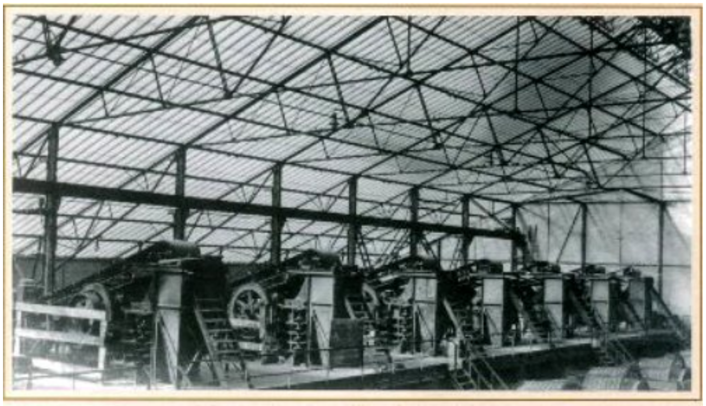
The locomotive shed

The 'Nuckelpinne'

The plant itself was carefully planned by Hörlein. Again, almost all the equipment, with the exception of the conveyor belts and some electrical appliances, was sourced from Germany. To avoid large waste and tailings dams the plant was erected directly next to the beach. It was sufficiently elevated to allow the material to move through the plant by gravity, and the barren tailings were disposed of directly into the sea. In contrast to Kolmanskuppe, where treatment was mostly dry due to the high cost of water, ore treatment at Elizabeth Bay was wet. This did not present a problem as the sea was close by. The storage bunker which received the ore from the mine had a capacity of 6,000 m³ and occupied a cavity that was excavated from the underlying rocks in massive blasting operations. The plant itself was fully mechanised which reduces theft and was designed for a head feed grade of 15 carats per 100 tons.

It received its light through roofs made of Georgian wired glass. Consolidated material was treated in rod mills before the ore was classified into three fractions using mechanised trommel sieves: +5.5 mm, 5.5mm to 1.3 mm. Unconsolidated material was fed directly into the trommel-sieve section of the plant via conveyor belts. The three fractions were treated separately in 240 two-stage Schiechel separators, followed by a second treatment of 80 three-stage Schiechel separators.

The resulting concentrates were treated in eight Stauch jigs and then sorted by hand. The tailings from the hand-sorting were then put onto a magnetic separator, after which the magnetic fraction was discarded into the sea and the remaining material reintroduced into the circuit.The plant treated 10,000 m³ per day and discarded some 3,000 m³ of overburden sand per day. Upon arrival at the plant this overburden was sent to a tunnel running underneath the plant, where it was mixed with waste water and conveyed to the sea by means of a screw feeder.



Belts conveying material from the storage bunker

Final treatment with Schiechel plant in background

Concentrates sent to the first set of Schiechel separators, mounted to some 1,300 m³, while around 1,300 m³ reached the second set. Some 400 m³ were sent to the Stauch jigs. Which produced approximately 10 m³ of final concentrate. Twelve systems ran in parallel, and groups of 3 systems shared one crusher for the cemented material.

On 1 October 1926 CDM commissioned a large and modern plant at Elizabeth Bay, and full production was achieved before the end of 1926. At the time

Lower station and jetty

and was the most modern diamond-recovery plt in the world. Hörlein had been the driving force in all stages of planning, design and construction, utilising all his 15 years of experience in alluvial diamond mining. Production started two and a half years after the groundbreaking ceremony, and building was completed after four years – a great achievement indeed. Nevertheless, mining problems posed by the heavy dune sand overburden and the erratic occurrence of the diamonds still had to be overcome, and would take until 1930 before a completely satisfactory mining process was in place.Electricity for the plant was sourced from the Lüderitz power station and transformed in the so-called Lower Station at Elizabeth Bay. The Lower Station comprised four transformers made by AEG and an aggregate made by Oerlikon. Some 30 kV of current received from Lüderitz was transformed into 3 kV for the shovels and into 500 V for the plant. The Lower Station also supplied the railways and the blasting operations with power.

Lower station

Water consumption at the plant was substantial, and four centrifugal pumps with a capacity of 27 m³ per minute, also housed in the Lower Station, pumped water into an elevated canal. The canal supplied the trommel sieves, rod mills and separators with water. A jetty was built to extend far enough into the sea to avoid the pumping of suspended fines. Furthermore, the Lower Station was responsible for the pumps that supplied the central plant at Kolmanskuppe. For this plant, water was pumped into a small settling pond and from there onwards to other destinations.

Trommel sieve section