examined and analysed above ground. These drillings that were carried out after the 1930´s, greatly reduced the economic risk of building up existing mines and also of putting into operation new mines planned for the future, because the reliability of the mines could be better calculated after analysing all the drillings. The maximum drilling length of this tool was 300 m, the amount drilled in one shift about 6 m.

2.9 ⚒ Blast holes and blasting

Drilling of blast holes and blasting: The hard red iron-ore had to be drilled and blasted away from the walls.

Up until 1904 the blastholes were produced by laborious manual work (using a hammer and a chisel), afterwards with compressed air. A lot was gained from the new method of pneumatic drilling, but at the same time a new problem arose: The miners were taken ill with so-called silicosis, rock dust on the lung, because the dust that was breathed in contained silicic acid.

It wasn´t until 1954 that this problem was solved using wet drilling. With this method water was washed into the drill-hole through the drilling-rod, thus preventing the rise of rock dust. When the drilling is demonstrated, don´t forget that a miner had to endure this work for three or four hours every day.

The next stages will show technical inventions, which since the 1950`s have gradually made the heavy work of the miner a lot easier.

2.10 ⚒ Shovel loader (1954)

Shovel loader Atlas Copco LM 30 based on tracks. It was used for straight lines.

Since 1954 shovel-loaders driven by compressed air were used in Fortuna Mine for heading-out new tunnels. They threw the rocks which had been blasted away from the walls into the coupled-on mine cars. They were hardly used for iron-ore mining though, because the rails prevented them from being used flexibly.

2.11 ⚒ Scraper (1960)

Scraper which made the removal of the iron ore much easier. The engine together with the steel box pulled the blasted iron ore into a chute and the iron ore dropped under gravity into a tipping wagon which stood on the next floor level down.

Since 1960 the so-called scrapers took over from the manual work of loading and unloading the iron. At the same time a steel crate would drag the stone (blasted away from the rock) into a shute. Think about the beginning of the rise drift - at point 2.6 - directly in front of the winding spool. The iron could then be loaded into mine cars at the level below (in that case the 200 m level).

2.12 ⚒ Shovel loader (1964)

Shovel loader, type Atlas Copco T 2 G based on pneumatic tyres. Maximum distance to the next chute 40 m due to the pipe filled with compressed air.

After 1964 the rubber-tyred-rucksack-loader was used in iron-ore mining. It could take the loaded iron to a distance of 40 m and tip it onto the next chute. Whilst it was driven, the compressed air tube was dragged with it. This required some skill from the miner, who operated the machine.

2.13 ⚒ Shovel loader (1971)

Diesel engine shovel loader, type Eimco 911 (Load-Haul-Dump) increased the productivity up to 12 tons per man per shift, however, it was necessary to install huge pipes with strong ventilators which pushed out the exhaust fume to the surface.

After 1971 iron-ore mining was gradually converted to diesel vehicles. This LHD-Technology (Load-Haul-Dump) brought an increase in performance to 12 tons of iron per man per shift. For this American Shovel-Loaders, Eimco models 922 (which can be seen here) and 912 were used, in addition to these two gadding-cars and one demolition vehicle.

A ventilation system up to the ground surface was installed so that the strain of exhaust fumes underground remained bearable. But despite all these efforts the „Grube Fortuna“ had to stop mining in March 1983, because the iron could not longer be sold at a profitable rate. Iron from abroad for example, from Africa or Brazil was cheaper for the German blast furnace works. In the end about 50 miners extracted around 90,000 tons of iron-ore per year.

2.14 ⚒ The toilet ☺

Here you can see something very rare: When absolutely necessary visitor‘s to the mine can go to the toilet at a depth of 150 m. The miners, however, never used to have such a comfort. They had to use one of the metal latrines shown here. In all about 13 of these latrines were located throughout the mine. For emptying, disinfecting and replacing the latrines a miner received a bonus of 50 German Marks per month.

**We will now travel by mine-train back to the shaft.
Once again please sit still on the train, but this time,
the other way around, facing the shaft.
Remain seated and keep your arms and legs in!**

Water and Work

We will get off the train at the pit bottom. It ought to be mentioned here that up to 1.5 m³ of water flows into the Fortuna Mine area every minute. This water collects in the shaft underneath the 150 m level and is pumped out. It‘s used as drinking water in the town of Wetzlar - and for a geothermic power plant: We are heating our buildings with water!

Whilst travelling in comfort and with some speed back up the shaft, just remember that the miners up to around the year 1900 had to cover the whole of this distance by foot (up the shaft on vertical ladders) and that was after having already walked for 1 or 2 hours to the mine itself.

Back down the tunnel again and we will be back out in the open, after which we´ll go back into the changing room. Please hang your overall up and put your helmet back onto the shelf.

**The official guided tour of the mine is now over!
We thank you for visiting the mine
and hope that you enjoyed it.**

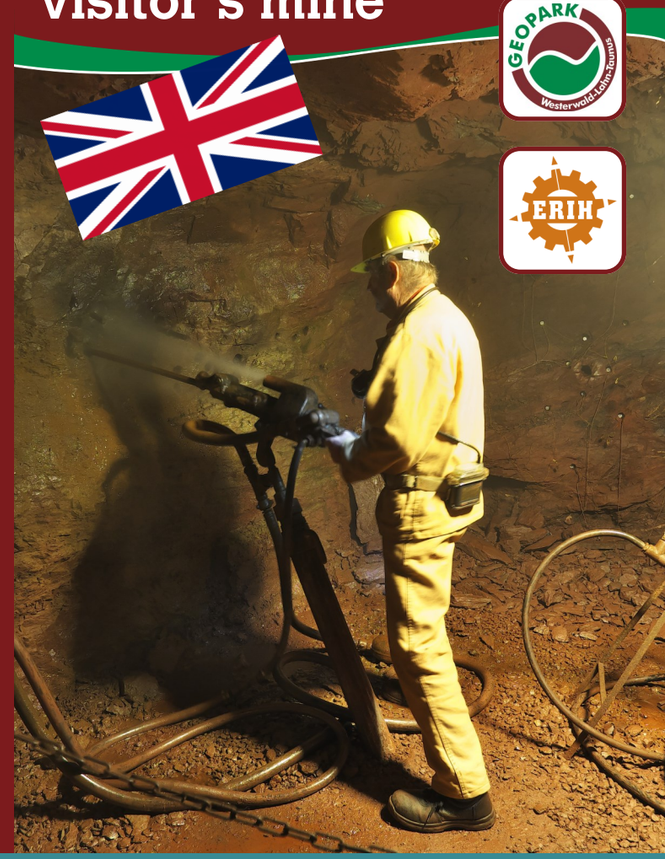
**Don`t forget to recommend the Visitor‘s Mine
Grube Fortuna to your friends.
Support us, rate us, follow us - thank you!
Facebook ⚒ Google ⚒ Instagram ⚒ TripAdvisor
#grubefortuna ⚒ www.grube-fortuna.de**

We`d now like to take this opportunity to recommend to you a visit to the machine house on top of the hill. You can get to it by walking up the steep path, which runs around the back of the mine house to the right.

Have a save journey home and:

(a phrase used by the miners,
to wish their colleagues „Good Luck!“)

Museum guide for the visitor‘s mine



Glück Auf!

... know where the Iron comes from!

10/2019

Bergmannsroute

DAS LAHN TAL

GRUBE FORTUNA

Welcome to our Cultural Heritage!

The Visitor‘s Mine wishes to recall the 2000 years old history of the iron-ore mining industry in the Lahn and Dill areas. This mining industry, the iron and steel and associated iron-processing industries all used to give work to the people of our region. But since the discontinuation of mining at „Fortuna“ on the 4th of March in 1983 this tradition has died out here and throughout the whole of Hessen.

The descent into the mine should give you an impression of the hard and dangerous work of the miners underground, of the technique used for the iron-ore mining and of the geology of the mine itself.

Before the tour begins here are some details on the history of the Fortuna Mine: We don´t know very much about the running of the mine early on, because written sources were only available from 1848. In 1849 the mine was possessed by the Prince of Solms and Braunfels who, at that time, owned the most important iron-ore mines in the Lahn area.

In 1906 the Prince sold his entire mine ownership, which also included the Fortuna Mine, to the Krupp firm (from Essen). Krupp had a completely new mine plant build, from which the old steam-engine shed on top of the hill has been retained. From 1849 to 1983 the „Grube Fortuna“ miners extracted a total of 4,6 million tons of red iron-ore. That is equivalent to a railroad train of about 1000 km in length.

After the number of your group has been called out (this number is your entrance ticket), please go through the museum to the helmet chamber. Here you will be given a helmet and a jacket. The guided tour will now begin!

On the spots where your tour-guide gives information you will see white noticeboards with numbers. These numbers can also be found on this information sheet. Please read the notes to each corresponding number whilst the tour-guide explains it in German!

2.1 ⚒ Conveyor cage

Here you can see an original conveyor cage. During the production time there were two in operation, one went up, the other went down.

In front of the entrance tunnel you can see an old mine cage. Up to the closure of the mine two of these cages provided transportation for the iron-ore from the miningshaft. But because there was only enough room for 8 people in such a cage, a bigger cage has now been installed in the Visitor‘s` Mine for a maximum of 22 people. We will now go about 160 m along the „Deep Tunnel“ to the mining shaft. This „Deep Tunnel“ was used as the main haulage tunnel in the mine.

2.2 ⚒ Mine shaft

We are entering the conveyor cage and are going down to the 150 m floor level.

You are now standing at the top of the mining shaft to the „Fortuna Mine“. To start off with this shaft was sunk, from here, down to a depth of 150 m. This was in 1943. At that time the old shaft had caved in, because during the war the wooden reinforcements had not been renewed in good time. At the end of the shaft there is now a small auxiliary haulage engine. The big haulage engine was moved from here to the surface at the end of the 1950´s, to make room for the shunting of the mine cars. At this time the shaft was also sunk by a further 100 m.

Please look at the diagram of the mine on the board. You will recognize the „Deep Tunnel“, the mining shaft and the different levels (a level is a „Gallery“ in the mine, which has no direct connection to the grass surface above). You will now travel in the mine cage down to the 150 m level. There you will get on a mine train which will take you to to a distance of about 450 m to the area where iron-ore was mined.

The mine cage travels at a speed of 4 m/sec. The winding-engine man will receive a bell signal from the tour-guide. Three rings means down. On the way down you will see the old levels at 40, 65, 100 and 125 m.

2.3 ⚒ Filling station

This is the filling station on the 150 m floor level. Here the loaded tipping wagons arrived and were pushed into the conveyor cage.

We are now at the pit-bottom, at a level of 150 m. During the running of the mine, mining cars full of iron-ore were shunted from here into the mine cage using compressed air (see the fluorescent picture). We will now get on the mine train.

Warning! Whilst the train is in motion remain seated and keep your arms and legs in!

2.4 ⚒ Cross section

The iron ore (red) is situated between the old rock (yellow) and the younger rock (blue). Before you go into the iron-ore mining area the tour-guide will explain to you the rock structure, the iron-ore deposits and how the deposits were formed.

A cross-section of the rock shows the different types of rock stratum.

The iron-ore deposits are situated at a thickness of 0 to 20 m between the old rock (here shown in yellow) and the young rock (lime slate, here shown in blue). About 350 million years ago there was a primeval sea here in the Lahn region. The old rock was formed from volcanic flying ashes , which rained down and built up in this sea. Later on an iron bearing solution rose up from crevices in the earth´s crust and formed the iron-ore deposits laid flat on the sea bed. But in the following period the rivers transported lots of earth, boulders and sand into the sea from which the young rock roof emerged on top of the iron-ore deposits.

About 150 million years ago strong pressure movements within the earth´s crust caused the landscape of the low mountain ranges to fold upwards. This caused the sea water to drain away, which distorted the rock strata. This is the reason why the iron-ore deposits in the Fortuna Mine are no longer flat in the rock but through-shaped (here shown in red).

The tour-guide will show you the way that we have just talked about . We have now reached the mining area!

2.5 ⚒ Cavity called „Toter Mann“

This cavity was originally filled with iron ore. After the mining the cavity was filled up with dead rock.

The cavity at the end of the downwards-running slope was once filled with iron.ore, the blanket deposit. You will recognize the three -dimensional formation of the iron-stone in the rock. The cavity was then filled with refuse rocks. A more detailed explanation of this will come later. The rock roof was propped up wih an ore buttress. Only seldom did it have to be supported by artificial means. The wooden props or steel anchor screws were set into the rock (a specimen of this can be seen on the pile). The anchor works like a plug.

On the way the tour-guide will show you a place to the right of the path, where the sequence of layers of volcano flying ashes (light coloured underneath) and iron-ore (on top, red to steel blue coloured) can easily be recognized.

2.6 ⚒ Raise drift

This hole is called raise drift or chute and is very important for the removal (top down) of the iron ore.

Steap rise drift or shute (this means: a hole, through which some rocks roll). There were many connecting routes in the Fortuna Mine for example horizontal routes (like the tunnels and levels) vertical routes (like the shaft) and sloping routes performed more operations in the mine: material and personnel transportation, the supply of fresh air and the transportation of rocks. The shute at the end of the upwards-running slope, known as the „rise drift“ to the miners , served as transportation shute for refuse rocks, which were poured in at the 100 m level. The refuse rocks could then be shuved into a mine car through a steel or wooden trap lid. The rocks, which were themselves worthless, were then used to fil in the cavity caused by the iron-ore mining.

Making such „rise drift“ was very difficult for the miners , because they always had to work in an upward direction in dampness, darkness and when the air was bad. Look at this situation on the fluorescent picture!

2.7. ⚒ Start of the mining

Mining takes place always from bottom to top. The iron-ore deposits, which for the most part were set at a semi-steep position into the rock, were split up into a multitude of some 50 m sections (the so-called mine workings). The ore was always mined from bottom to top, in this case from the 150 m level to the 100 m level.

You are now standing at the beginning of such a mine workings and you will recognize a wall made from refuse stones. These stones came down a shute from the next highest level and had to be continuously piled up to the top, so that the miners could stand up whilst working. The miners got their place of work by using an iron ladder (this can be seen on the left). A wooden chute was built for the transportation of the iron ore that was blasted away from the rock and this chute was continually lengthened towards the top to the mine (on the right).

This method of mining was practiced up until about 1960 and was very labour-intensive. Achievement was correspondingly low: 1.5 tons of iron per man per shift. It took about nine years for the miners to mine the iron-ore deposits rom here up to the 100 m level. In the 1960´s a more profitable method of mining was changed to. The cavities were no longer filled with refuse stones instead ore buttresses were erected to prop up the rock roof. You can see this situation on the way to point 2.8.

2.8. ⚒ Rotary coring machine

Rotary coring machine which was developed in order to take rock samples out of the rock for investigated above ground.

Here you can see a core drilling tool driven by compressed air with mechanically controlled feed. This tool enabled a precise examination into the iron-ore deposits underground to be made (for example: how powerful were they? Which course did they take? What type of composition did the iron have? The amount of iron content?). The drill-cores were