Fact Sheet 8: Safe Energy

Mayak – lessons are not learned

Contact: The Planet of Hopes:
planeta_zato@mail.ru;
wecf@wecf.eu;
info@umweltinstitut.org
www.wecf.eu
www.umweltinstitut.org

30 years prior Chernobyl: Mayak, Production Unit

If it weren't for the Chernobyl accident, the world might have never known that deep in the heart of Russia, at the foot of the Ural mountains, where Europe meets Asia, there had already been an accident similar to the latter in its scale.

The location of that first nuclear catastrophe remained confidential for a long period of time. It never had an official name, and was thus only known as the 'Kyshtym crash', after a small old town not far from the secret city of Chelyabinsk-65 (today known as Ozersk) where the said tragedy took place.

Long before it was decided to use nuclear power for energy production, scientists had discovered its horrifying destructive force for arms production. Nuclear arms production. Weapons which, if used, could destroy the very life on Earth. Thus, before the Soviet Union produced its first nuclear bomb, scientists built a factory in the Urals to manufacture its core. That factory was named Mayak .

During the production of the materials needed for the manufacturing of a nuclear bomb, scientists did not worry about environment or health issues. They were more afraid to fail a state assignment. To obtain the necessary substances for an atomic bomb – uranium and plutonium – they had to conduct many a chemical reaction. As a result, they acquired

not only the above-mentioned chemicals, but also large amounts of radioactive water (i.e. fluid radioactive waste).

Even then the scientists had already divided radioactive waste into three categories, depending on the level of radioactivity: Highly Radioactive Waste (HRW); Medium Level Radioactive Waste (MRW) and Low Level Radioactive Waste (LRW). The waste contained large amounts of traces of uranium, strontium, caesium, plutonium and other radioactive elements.

At first the radioactive water was dumped directly into the river Techa, on the bank of which the factory stood. However, when deaths occurred in the villages on the banks of Techa, scientists decided to limit the wastage dumped into the river to the Low Level Radioactive Waste. The Medium Level Radioactive Waste was now dumped into the lake Karachai; while the Highly Radioactive Waste was kept in special corrosion-proof containers – "tanks" – that were located in concrete basement storage areas. As a result of the radioactivity of the substances, however, these tanks heated up immensely and were thus required to be cooled down with water over their entire surfaces. Every "tank" had its own cooling system and control system, to keep its content under control.

Towards the autumn of 1957, the performance of the measuring devices that were borrowed from the chemical industry and were kept in the storage areas grew unsatisfactory. As a result of the highly radioactive nature of the cable conduits in the storage areas, the latter were not renovated.

At the end of September 1957 a serious brake-down of the cooling

system as well as the control system on one of the tanks occurred. That day, factory workers who were conducting check-ups on the tanks discovered that the tank was highly heated. However, they were not able to report this to the management. The tank exploded.
The self-combustion of the 70-80 tons of highly radioactive waste mainly consisting of nitrate-acetate compounds, resulted from a malfunction of the cooling system because of corrosion and failure in the control system of one of the containers (with a volume of 300 cubic metres). On the 29th of September 1957, at 4 P.M. local time, the evaporation of water, drainage of the remains and its heating up to 330-350OC resulted in the explosion of the contents of the container. The force of the explosion that was similar to a gunpowder explosion was judged to have been up to 70-100 t. of trinitrotoluene.

The complex containing the exploded container was an underground concrete construction with cells (i.e. trenches for the instalment of 20 containers). The explosion completely destroyed the corrosion-proof container located in a concrete trench 8.2 metres deep in the ground. It also tore off and threw the concrete cover of the trench to a 25 m distance.

20 million curies (Ci) of radioactivity was thrown into the air of which 18 million (90%) landed within the Mayak complex. Radioactive pulp of 2 mln Ci with a volume of 250 cubic metres was thrown up to 1-2 km into the air and created a radioactive cloud

consisting of liquid and firm aerosols. The south-western wind with a velocity exceeding 10m/sec that was present in the top layers of the aerosols spread the latter around. Four hours after the explosion the radioactive cloud moved a 100 km, and after 10 -11 hours the radioactive trace was completely shaped. The two million Ci that descended onto the ground formed a polluted area that spread out for 300 -350 km to the north-east of the Mayak factory. The border of the polluted area was traced along a chorisopleth with a pollution density of 0.1 Ci/m2 and a territory of 23000 m2 . As time went by, these borders were blurred as a result of the movement of radionuclides by air.

Soon after the territory was named Eastern Ural Radioactive Trace (EURT), while the main part of it that was most polluted (700 km2) received the status of Eastern Ural national reserve.

The maximum length of the EURT is 350 km and is just a small distance away from one of Siberia's largest cities: Tyumen. The EURT's width reaches as much as 30-50 km at places. Within the margin of the chorisopleth of 2 Ci/m2 on strontium-90 there is a territory of almost 1000 km2 (105 by 8-9 km).

The radioactive pollution zone contains a territory invading three provinces: those of Chelyabnisk, Sverdlovsk and Tyumen with a population of 270.000 people previously inhabiting 217 cities and villages.

23 villages were evacuated and destroyed; wiped off the face of the earth. Cattle was killed, clothes burnt, food and demolished buildings dug into the earth. Ten thousand people who had suddenly lost everything were left helpless and departed to their relatives.

An investigation on the part of the nuclear industry after the crash concluded that the most probable cause was the explosion of dry salts of nitrate and sodium acetate that were formed as a result of the evaporation of the solution in the container because of its self-combustion after a malfunction in the cooling system.

However, so far no other, independent investigation was carried out and many scientists believe that the Mayak explosion was a nuclear one. Fifty years after the crash the technical or chemical reports of it have not been published.

4 P.M. on the 29th of September 1957 have come to constitute a black page in the history of the Urals. At the time 272 000 people lived on the polluted territory. It is a day that divided the lives of the people of Ural into two: before and after the crash.

Hundreds of thousands of people were needed in order to liquidate the consequences of the crash, i.e. to wash the industrial territory of Mayak with water and discontinue any economic activity in the polluted zone. Young men from close by cities and towns of the Chelyabinsk and Sverdlovsk provinces were mobilized for the liquidation unwarned of the dangers. Whole military units were brought to surround the territory of the liquidation and were prohibited from telling where they had been. Children of 7-13 years of age from the surrounding villages were sent to dig radioactive crops into the ground, as it was autumn. Mayak even used pregnant women with any period of pregnancy for liquidation-related works.

The consequences for the people

In the Chelyabinsk and in the atomic city of the region the death rate was immense. People died at work; deformed babies were born; whole families died out.

Nadezhda Kutepova, representative of the "Ecodefence" group in Ozersk: *'My father was 17 years old and studied at a technical school in Sverdlovsk (now Ekaterinburg). On the 30th of September 1957 along with fellow students he was put on a truck and brought to Mayak to liquidate the consequences of the crash. They weren't told anything about the gravity of the danger of radioactivity. They worked for days. They were given individual dosimeters, but over-dosage was punished, so many left their dosimeters in their clothes boxes, to not 'have a too high a dosage'. In 1983 he was diagnosed with cancer and referred to Moscow for surgery, but died three years later as metastases started to appear all over his body. We were told then that it wasn't because of the crash, and only later the disease was officially recognized to have been a consequence of the Mayak accident. My grandmother also participated in the liquidation works and received a dose of 770 rem (Roentgen Equivalent Man). I never saw her because she died of lymphatic cancer long before I was born (eight years after the crash).'*

Gulnhara Ismagilova, inhabitant of the Tatarskaya Karabolka village: *'I was nine years old and was studying at school. They gathered us and said that we will be harvesting. It appeared strange to us that, instead of harvesting, we were told to dig the crops into the ground. Meanwhile police had surrounded us so that we couldn't run away. In my class the majority of the students later died of cancer, and the ones that were left were very ill, the women suffering from infertility'*

Natalia Smirnova, inhabitant of Ozersk: *'I remember that in the city there was a horrible panic at the time. On all streets cars were driving around and washing them. We were told on the radio to throw away everything that we had in the house and to wash the floors constantly. Many people, workers at Mayak, fell ill with the acute radiation sickness, everyone was afraid to say or ask anything out of fear to get fired or even arrested'.*

P. Usaty, Novo-Pavlovka village, Krasnodarski region:
'I served as a soldier in the closed zone of Chelyabinsk-40. On his third shift, a fellow countryman from Yeysk fell ill; when we came back from work he died. At the transportation of cargoes in train carriages we stood on posts an hour each until our noses bled (a sign of acute irradiation - author's note) and our heads hurt. On the sites we stood behind a two meter high led wall, but even that didn't help. During the demobilization we had to sign a non-disclosure form. Out of the conscripts there are just three of us now – all handicapped.'
It was an enormous catastrophe. Yet it was hidden. Because the state did not need people, it needed bombs. The latter, not even having become bombs, killed and continue to kill large amounts of people.

Only after the Chernobyl disaster many in the Chelyabinsk region understood that they could now talk about the Mayak disaster. Thus, in the early 90s, over 30 years after the crash, a report of it was published for the first time. To at least compensate the harm somehow, a law was passed on social security for those harmed by the catastrophe. However, no-one will ever know exactly how many people died because of it, as, until now, the Tatarskaya-Karabolka village with its 7(!) cemeteries and 400 inhabitants is still left on the radioactive trace. Because of the genetic harm of radioactivity three, four and even five generations of people exposed to radiation will fall ill with untreatable illnesses. According to the new law currently under consideration in the Russian Duma those harmed as a result of the explosion at Mayak have a right to a compensation of 37 roubles (approx. EUR 1-M.O.) A MONTH for food.

Today, 50 years have passed. Mayak is still working. The people working there and living near it are accumulating plutonium, caesium and strontium in their bodies. As before, every second, every minute, and even as you are reading this lesson, Mayak is producing tons of radioactive waste that remains after the processing of fuel from the nuclear power stations. And, as before, it dumps the waste into the water, only not the river Techa, but the lake Karachai. This means everything can repeat itself. Do we need that?

P.S. In one of the villages left on the polluted ground, children wrote the following poem:

The beams of Mayak are not those of salvation,
Strontium, Cesium, Plutonium are its executioners.

Nadezhda Kutepova,
The Planet of Hopes,
Chelyabinsk Region, Ural, Russia

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