

SUMMARY

In the underground mines of KGHM Polska Miedź S.A. in Poland, copper ore contains up to 2,66% of pure copper which is excavated to the surface through mining shafts, which is then transferred to the Ore Enrichment Plants (Polish name: Zakłady Wzbogacania Rud ZWR). In the flotation enrichment process at the Ore Enrichment Plant, a copper concentrate of approximately 26% is obtained, which is processed in smelters into pure copper and silver. The remaining part of the ore, constituting flotation waste, is transported through the pipelines to the Mining Waste Disposal Facility (Polish name: Obiekt Unieszkodliwiania Odpadów Wydobywczych Żelazny Most OUOW). The hydrotransport of flotation waste from the Ore Enrichment Plant to the Mining Waste Disposal Facility runs under pressure through main pipelines, with nominal diameters from 800 to 1000 mm, over a total length of approximately 250 km, contributing to rapid abrasion of the technological installation.

Solid waste remains at the Żelazny Most Tailings Storage Facility, while clarified water is recycled for reuse in the Ore Enrichment Plants. Any excess water, after purification, is discharged into the Odra River.

The extraction of copper ore and its processing into pure metal, i.e. copper, generates a number of technical challenges at every stage of production, from excavation through processing, which takes place in three Ore Enrichment Plants, to the disposal of flotation waste generated in the copper ore enrichment process. Flotation waste generated in the flotation process in the Ore Enrichment Plant is transported daily *via* technological pipelines directed to the Żelazny Most Tailings Storage Facility.

In transmission networks, there is a phenomenon of abrasion of pipelines and technological fittings, including valves, steel compensators and spare parts for pumps, causing the need to replace pipelines and technological fittings. The aim of this doctoral thesis is to reduce the failure rate of the technical infrastructure associated with copper ore flotation waste in KGHM Polska Miedź S.A. To achieve this, the work summarizes the failures of transmission pipelines and technological fittings that occurred between the years 2018-2023 at the Żelazny Most Mining Waste Disposal Facility. Additionally, this doctoral thesis presents proposed solutions to prevent such failures and reduce the

costs incurred by KGHM Polska Miedź S.A. In the final conclusions, after analyzing the summarized causes of failures, methods for their elimination, and performing numerical analyzes to support the interpretation of the failure causes, technical solutions are proposed that should significantly reduce the failure rate of the technical infrastructure at KGHM Polska Miedź S.A.

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* wyłączenie jawności w zakresie danych osobowych oraz prywatności osoby fizycznej na podstawie art. 5 ust. 2 ustawy z dnia 6 września 2001 r. o dostępie do informacji publicznej (tj. Dz. U. z 2026 r. poz. 1764)

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