WEARcore XD 67/1-O IS THE NEW AGE IN BACKFILL PIPE MANUFACTURING

Mining backfill pipe ID overlay success story

Authors:
Tamás Sándor PhD, IWE
Global Business Development Manager
Wear Protection and Special Applications
Thomas Russell
Territory Sales Manager Böhler Welding Canada, Ontario

The world's mining output has risen from 9.6 billion metric tons in 1985 to 18.7 billion metric tons in 2022, showing no signs of slowing down (World Mining Data, 2024). It is therefore fair to state that mining is the backbone of modern society and our way of life.

At the same time, mining is often perceived as a symbol of exploitation — where humanity extracts resources from the Earth and then leaves behind environmental scars.

This perception may lead one to believe that maximizing ore extraction is the sole objective of the industry.

However, this is far from the truth. Several other processes, nearly as important as extraction itself, operate behind the scenes to ensure safe, sustainable, and efficient mining operations.

One such process is backfilling, the focus of this success story.

BACKFILL PROCESS – INTRODUCTION

In the ever-evolving landscape of the mining industry, the backfill process has emerged as a cornerstone of sustainable and safe underground operations. Once considered a merely as a post-extraction necessity, backfilling has transformed into a strategic tool that enhances mining stability, optimizes resource recovery, and significantly reduces environmental impact.

At its core, backfilling involves the reintegration of materials — ranging from waste rock and tailings to engineered paste — into the voids left behind after ore extraction. This practice not only reinforces underground structures, mitigating the risk of collapses and subsidence, but also enables access to previously unreachable ore bodies by stabilizing stope walls and roofs. In doing so, it extends the productive life of mines and improves operational efficiency.

From an **ecological standpoint, backfilling plays a vital role in reducing the surface footprint of mining activities.** By repurposing tailings and other waste materials underground, mines minimize the need for large surface storage facilities, thereby lowering the risk of acid rock drainage and metal leaching. This closed-loop approach aligns with global sustainability goals and fosters better relationships with surrounding communities.

As environmental and social governance (ESG) expectations rise, backfill systems represent a tangible path toward greener mining. They embody a shift from extractive to restorative thinking—where the end of ore recovery marks the beginning of land rehabilitation and long-term stewardship.

Modern mining operations increasingly rely on advanced backfill technologies, including hydraulic, pneumatic, and paste fill systems, each tailored to specific geological and operational conditions.

During the backfill process empty tunnels, chambers, or other excavations are filled with **cost-effective ballast materials,** such as:

- Loose stones
- Rocks
- Limestone
- Dolomite
- Tailing residues

The backfill process is generally divided into **two main categories:** Dry backfill and Wet backfill.

Dry backfill is applied in wider tunnels where the earth moving equipment can efficiently fill the space with stones, rocks and minerals or dry tailings.

Wet backfill – the most common – is applied in narrow channels or stopes where the fluid but viscous paste filling is more practical and efficient (Figure 1). The most frequently applied wet backfill technique is the cemented sand paste backfill. It has gained prominence for its strength and versatility, especially in deep or geothermally active environments. These innovations are not only technical achievements but also responses to growing environmental and regulatory pressures but set new challenges for the industry from wear perspective.

Figure 1: Cemented sand paste backfill process in-progress. (Source: https://can.sika.com/en/construction/shotcrete-tunnel-ingmining/mine-backfillingmbfproducts.html)

THE CONVENTIONAL STATE-OF-THE ART SOLUTION

To create cemented sand paste, materials such as sand, fly ash, or gravel are mixed with a cementitious binder. This process makes a thick liquid that is ready for use. However, its ingredients make the paste very abrasive.Therefore, its transportation through pipes provides serious wear issues that resulted in regular pipe leakages. One solution that was introduced is increasing the wall thickness of the pipes, however this increased material costs drastically. Finally wear pipes are mainly used as this is the best alternative.

Wear pipe (or Chromium Carbide Overlay (CCO) pipe) is a mild steel pipe which has a certain thick hardfaced layer on the internal diameter (ID).

Backfill pipes are typically 150 or 200 mm in nominal diameter and have 2 layers (6-8 mm) of chromium carbide overlay.

Hardfacing is applied in the downhand position. The pipe rotates at a constant speed, moving a set amount after each rotation. This creates a spiral weld pattern on the ID. This is what we may name a state-of-the-art solution until 2025 for overlaying backfill pipes. This solution delivers 50-55,000 tons throughput before failure.

NOVEL BACKFILL PIPE OVERLAY SUGGESTION AND TEST BY UTP

The UTP team determined to improve the above-mentioned performance and received a challenge for a field test where UTP was welcome to offer a solution that potentially can outperform the above mentioned 55,000 tons throughput.

As a trial 2 long radius pipe elbows (Figure 2) were hardfaced and put into operation for real-life condition wear test.

Figure 2: A.) Long radius elbow made for exhibition. B.) View of the ID of long radius elbow. (Pictures were made by the authors with the approval and courtesy of Krucker Hardfacing.)

Based on the provided requirements of the ender user, UTP's self-shielded flux cored wires WEARcore XD 67/1-O was selected for the test.

Product information WEARcore XD 67/1-O			
High chromium alloy designed to resist extreme abrasion without impact. Self-shielded flux cored wire. Welding properties optimized for wear plate and pipe manufacturing.			
Hardness (as-welded)	**Max. Deposit thickness**	**Alloy type**	**Cutting / machining**
67 HRC	2 layers (up to 8 mm)	C-Cr-B-Ni	No flame cut, grinding only
Recommended welding parameters			
Diameter	**A**	**V**	**Stick-out**
1.6 mm	180-200 A	26-30 V	35-40 mm

In addition to its excellent weldability compared to conventional chromium carbide alloys, the product was expected to deliver superior wear resistance — particularly important in elbows, where increased friction naturally accelerates wear.

Welding parameters for WEARcore XD 67/1-O	Overlay layer
Diameter	1.6 mm
Wire feed speed	7.0 m/min
Welding current	220-240 A
Welding voltage	26.0 V
Stick-out	30-35 mm
Shielding gas	-
Polarity	DC+

RESULTS

The contractor who undertook the hardfacing of the elbows applied the WEARcore XD 67/1-O without any difficulty. After the simple welding wire change, the welding arc was ignited and the contractor's personnel was amazed by the visual appearance of the weld overlay and the smooth, interruption-free welding properties of the wire (Figure 3).

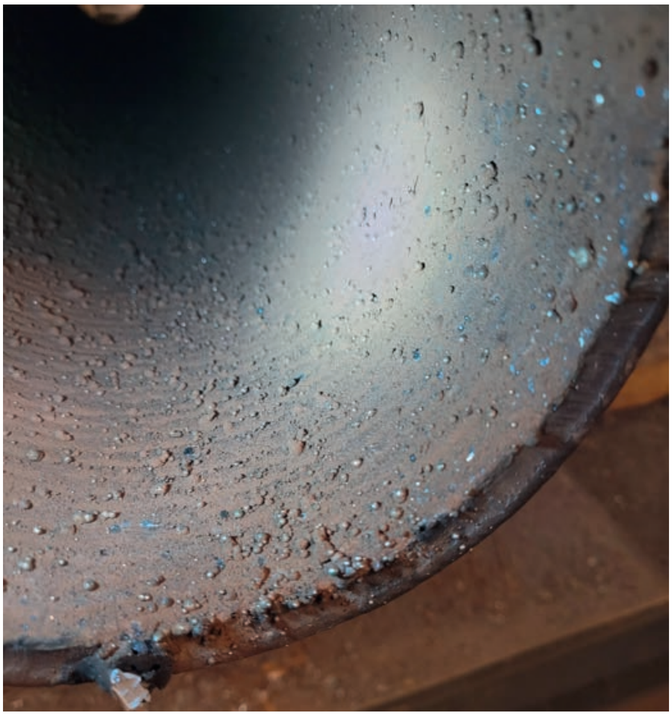

Figure 3. Actual view of the ID of one of the field tested long radius elbows hardfaced using WEARcore XD67/1-O after 15,000 tons throughput. Note the spiral weld beads are still visible which indicates a very low material loss.

The contractor was very satisfied. He confirmed the excellent weldability of WEARcore XD 67/1-O.

After the elbows went into operation, the field test began. The team waited for the results. The elbows first reached a throughput of 55,000 tons. This showed the product performed well. Later, the engineering company confirmed the final result: a total throughput of 95,000 tons.

CONCLUSION

The successful deployment of UTP's WEARcore XD 67/1-O overlay in mining backfill pipelines represents a major leap forward in wear protection technology. By exceeding the traditional throughput benchmark of 55,000 tons and achieving an impressive 95,000 tons, UTP has set a new industry standard for performance in highly abrasive backfill environments.

The use of WEARcore XD 67/1-O not only enhances operational efficiency but also establishes a new benchmark for sustainable and cost-effective mining practices. This underscores the critical role of continuous innovation in backfill systems to meet evolving environmental and operational challenges.

This breakthrough highlights UTP's core capabilities, reinforced by the exceptional durability and weldability of its products.

Tamás Sándor PhD, IWE

Tamás conducted his studies at the Budapest University of Technology and Economics, at the Faculty of Mechanical Engineering, and Welding Science, which was followed by the International Welding Engineer postgraduate study. In 2014, he acquired his PhD degree from Welding Science.

Working in the industry from 2003, Tamás has more than 20 years of experience in the areas of mechanical engineering, product-, sales- and marketing management as well as welding laboratory management with special focus and expertise in various hardfacing industry segments.

Tom Russel

Tom Russell is the Territory Sales Manager for Ontario at voestalpine Böhler Welding Canada. With over 20 years of experience in the welding and industrial sectors, including roles in chemical sales, gas distribution, and wear protection, Tom specializes in hardfacing, maintenance, and repair solutions for the mining, cement, and forestry industries. His hands-on expertise and customer-focused approach help bridge the gap between field challenges and innovative welding technologies that drive safer, more efficient, and more sustainable operations.