Complete Connectivity Solutions for Mines

ACHIEVING MISSION-CRITICAL & COMMERCIAL SITEWIDE COVERAGE

RFS

Introduction

Mining operations rely heavily on robust and efficient connectivity to ensure safety and promote productivity. However, they also pose one of the most challenging installation environments. Difficult access and irregular spaces deep underground make continuous and complete coverage particularly difficult.

The connectivity challenge is further compounded by the differing technologies needed at each level of the mine to ensure optimum coverage; surface-level infrastructure uses a completely different setup than deep underground, where new tunnels are being created. Plus, the Connected Mining Market is expected to grow from $18.43 Billion in 2023 to $73.0 Billion by 2032, underlining the need for additional coverage to support new applications.

Connecting a Mining Site

Mining connectivity is required to meet two key components: regulation and reliability. Mine operators need to deploy solutions that meet stringent regulatory standards. On a related point, they need system reliability with no connectivity blackspots to ensure site safety. Any mining system needs to be designed with this in mind.

Complete coverage

The unique underground environment of mines presents a particular set of challenges for delivering connectivity. Tunnels, shafts, and the presence of heavy machinery and rock formations require specialized solutions to offer seamless communication. Additionally, the solutions that work underground are not the best option to deliver surface-level coverage. They, therefore, need a multi-approach system to meet all site needs.

MINING SITE COVERAGE

In-mine Connectivity

Traditionally, mine operators have used antennas and repeaters for in-mine coverage. However, this requires a high volume of equipment to ensure complete coverage in hard-to-reach and obstructed areas. RFS advocates a different approach.

We use a **passive distributed Antenna Solution (DAS) with radiating cables** that work like antennas in long mining tunnels for mission-critical and 5G transmission.

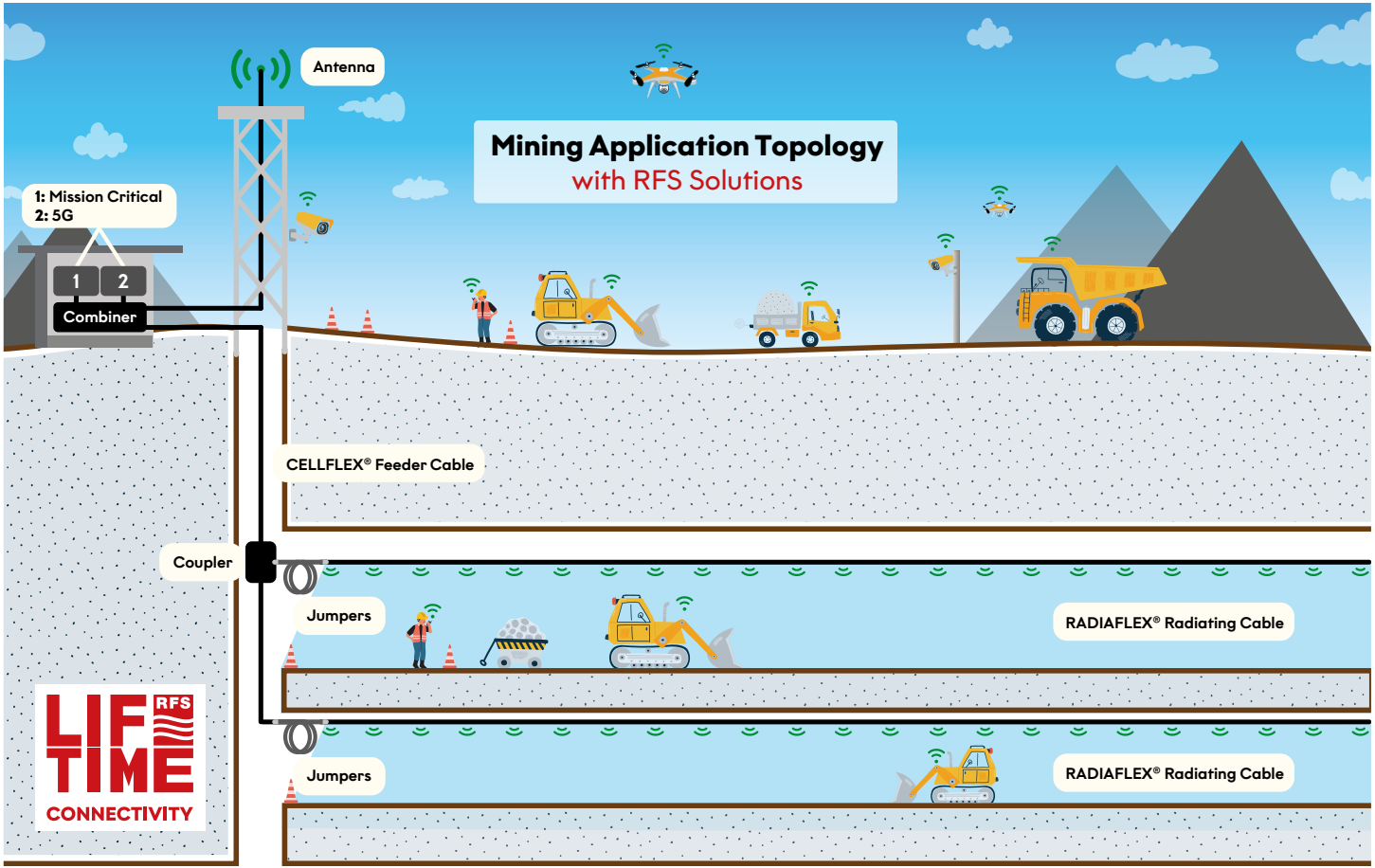
As a passive solution, RFS can provide a **self-declaration of intrinsic safety** in explosive environments. This is in line with ATEX and IECEx standards, as these certifications only apply to systems with their own ignition sources and are, therefore, not applicable to RFS's passive cables.

CELLFLEX feeder cables and jumpers bring the connectivity underground, where it is distributed to various sections of **RADIAFLEX radiating cable** installed within the mine. **HYBRIFLEX cable** is also used to deliver fiber and power [...]

[...] connectivity to remote devices.
RFS provides all the required passive components, such as **combiners, splitters,** and **cable**, as well as **fixing accessories and grounding kits**, to build a **complete RF system** from top to bottom of the mine construction.
The cables are also built to last and allow mine operators to move and redeploy the same cable in a new environment multiple times.

Surface Level Connectivity

At the surface level, the requirements are different, so a different solution is needed.
There are still obstacles to overcome, like deep pits or large machinery, which make conventional communication systems ineffective. Outdoor DAS uses **small antennas and repeaters** to distribute connectivity across the whole site, ensuring seamless connectivity for critical operations like equipment monitoring, worker coordination, and emergency response.
This type of system can be used to cover multiple frequencies, from mission-critical Private Mobile Radio (PMR) through to private 4G/LTE and 5G (6GHz), for more advanced but increasingly prevalent applications like robotics.


Mining Application Topology
with RFS Solutions
Antenna
1: Mission Critical
2: 5G
1
2
Combiner
CELLFLEX® Feeder Cable
Coupler
Jumpers
RADIAFLEX® Radiating Cable
Jumpers
RADIAFLEX® Radiating Cable
LIFETIME RFS
CONNECTIVITY

How RFS can help

We have so far looked at the technical components needed to deliver complete coverage across mining sites.
But what does this deliver for mine operators?

1 Reliability

A solution that performs on mission-critical frequencies isn't enough. For a system to be truly mission-critical, it needs baked-in redundancy and backup systems to deliver continuous performance. Using HYBRIFLEX fiber and power cable protects the power supply to remote devices. This ensures continuous power to the network, meaning it doesn't fail if there is a problem with part of the infrastructure.

2 Regulation

There are multiple regulatory requirements pertaining to equipment used in mines. When it comes to fire safety, RFS was the first vendor to offer a standalone solution to meet the highest CPR regulatory standard: B2ca s1 d0 a. This means no burning droplets accelerate a fire or emit toxic gases that further endanger life. RFS has continued its commitment to leading in fire safety with the recent opening of a second on-site fire testing chamber, as upholding the best standards in fire safety remains a priority.

3 Lower TCO

Mining operators benefit from several key advantages by using passive radiating cables rather than active equipment. It has fewer points of failure compared to its active counterparts, making it a more reliable option in many cases. This also means lower ongoing maintenance costs as it is a fit-and-forget solution until moved to work in a new space. The cost-effective nature continues with a lower upfront cost compared to active equipment and a lower energy consumption that reduces OPEX costs, giving a lower overall total cost of ownership.

4 Contoured Coverage

The cost-effective benefits of the RFS approach come without compromise. Using flexible radiating cable allows us to deliver contoured coverage. This means that the obstacles, like rock formations and plant machinery, are not barriers to connectivity. RADIAFLEX works around them to complete coverage in the most challenging spaces. The RFS team is made up of experts with experience working around the wireless challenges to deliver complete coverage without impacting the sustainability of the building.

Mini Case Study: Mining

RFS has worked with mine operators globally, including in Europe, Africa, and North America. Here is one example of a recent deployment.

RFS worked with a mine operator in Greece to meet their connectivity requirements as they developed and expanded multiple copper and gold mines. RFS has been supplying specialized cables and accessories to support the infrastructure for these mines since 2013. After a pause, the project resumed in 2020, and RFS has since delivered 17 km of specialized mining cables to the project so far, including robust feeder cables for the main tunnels and more flexible cables for the lateral tunnels. With the mines expected to operate for at least 15 more years, RFS has prioritized long-life and reliable solutions that meet the deployment needs.

At RFS, we understand the difficulties of delivering connectivity across the different environments of mining sites. With harsh conditions, it is vital to deliver robust connectivity that overcomes physical obstacles to support operations and maintains safety at all times.

Get in touch to discuss how we can help.

Complete Coverage, Lifetime Connectivity

Discover how our premium solutions ensure the comprehensive connectivity needed for your warehouse to support any application. **Scan the QR code to learn more and connect with our experts.**

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