MINING INDUSTRY
OCCUPATIONAL
SAFETY & HEALTH

MINERALS COUNCIL
SOUTH AFRICA

LEADING PRACTICE IN-STOPE PERMANENT MESH SUPPORT CASE STUDY CASE STUDY AT MASIMONG MINE

"Masimong Mine has been implementing in-stope netting to minimise FOG risk. "

FULL DESCRIPTION OF THE RISK ADDRESSED

Fall-of-ground (FOG) incidents and accidents have continued to plague the gold mining industry from its inception on the Witwatersrand, to this day. The FOG-related loss of life and injuries has had a negative impact on safety, production and the morale of the workforce. This needed a daring and innovative solution in order to be rectified. Masimong Mine is an intermediate to deep level mine where a risk of gravity-related and seismic-induced FOGs exist. An intervention was undertaken by Masimong Mine to reduce the FOG incidents and accidents on the operation.

Since 2016 Masimong Mine has embarked on implementing in-stope netting to assist with a real coverage when drilling the face. Probability and risk of FOGs was minimised as temporary nets were installed, prior to work commencing on the face and these were then removed before the blast. The first nets to be trialed and rolled out were the polypropylene rope type nets which were installed with the initial entry examination and removed once temporary support was removed, with the main challenge being net sag.

FOG incidents/accidents were also occurring on the night shift and an alternative netting was investigated to act as a permanent fixture that could withstand the blast and did not require to be removed before the blast. A steel cable net was implemented and integrated with the support being used, making use of the in-stope tendons to suspend the net as close to the hanging wall as possible. Washer sizes on tendons were increased to properly suspend the net. The sag of the net especially in low stoping widths remained a concern as the scraper damaged the netting.

In 2019 the Masimong Mine team visited a platinum mine to investigate a steel mesh being used underground with anti-corrosion properties and high tensile strength. It also had a cable in the mesh to assist against blast damage. The key to this approach was that it had to be secured with tendons to the hanging wall as it secured the cable protecting the mesh from the blast. The mesh was rolled out at Masimong Mine in the same year and it withstood the blast, but cleaning was still

OVERVIEW

Mining company
Harmony
Commodity
Gold
Operation/Mine
Masimong Mine
Health and safety case study
Permanent in-stope netting
Number of employees affected by the health and safety case study
±2000
Stakeholders consulted
Full-time health and safety representatives, management, unions, suppliers
Occupations affected/benefited
Rock-drill operators, stope-team members, winch operators, miners, team leaders, shift bosses, mine overseers and service departments

an issue in stoping widths <1.5m. The damage was investigated and small changes were made like changing the scraper by making all the edges on the scraper round. Drilling of tendons in low stoping widths also remained a challenge and alternative side mounted air legs were designed to ensure tendons could be installed to suspend the mesh.

FINDINGS AND LESSONS LEARNED FROM THE ADOPTION OF THE IN-STOPE NETTING

The journey to full adoption of the in-stope permanent mesh was characterised by several challenges and lessons along the way:

- Consultation with various stakeholders were conducted in order to obtain the most suitable net to suit the mine's requirements. This led to the anti-corrosive, high strength mesh as being the best suited given the installation of tendons in the hanging wall. Underground product trials were conducted progressively with rope/ polypropylene nets, steel cable nets and high tensile strength steel mesh.

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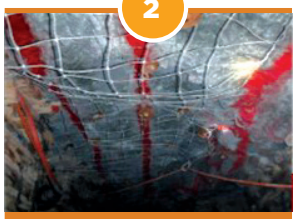
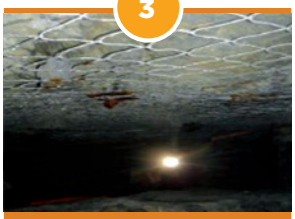
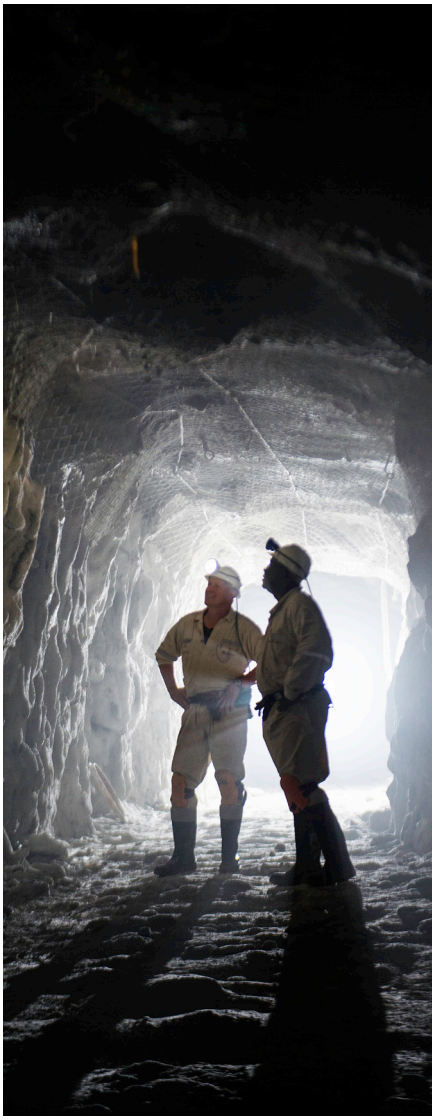
		
ROPE/NYLON NET	**STEEL CABLE NET**	**HIGH TENSILE STEEL MESH**
• No tensioning on the net • Low hanging nets resulted in damage from scraper • Rope strands prone to breakage	• Corrosion when exposed to the elements • Untensioned net results in damage from scraper	• Corrosion resistant • High load-bearing capacity • Blast-resistant

- Permanent mesh initially introduced in areas with stoping widths >1.5m in order to avoid scraper damage. Scrapers were modified in order to eliminate sharp corners and hooking onto nets. Modified scrapers allowed for cleaning in areas with low stoping width (>1.2m).
- The removal of S-Hooks from washers reduced incidents of the tendons and nets being pulled out by the scraper. Tendon support must be installed at the correct angle and spacing in order for netting to become effective and to prevent any sagging, drill rigs were modified.

Changes made to the scraper and drilling machine to install netting in low stoping widths.



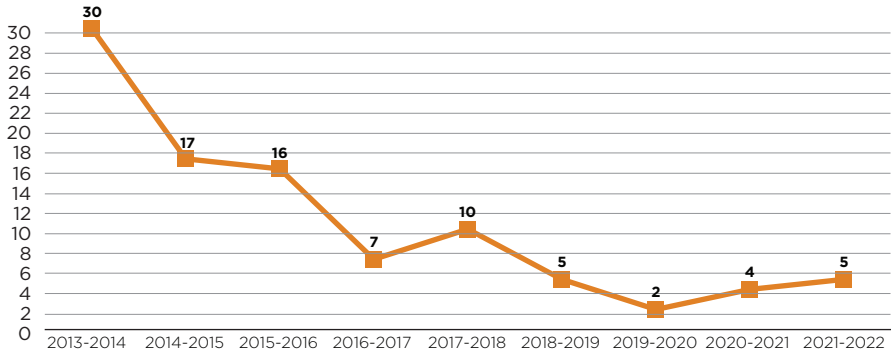
Hamony – Masimong

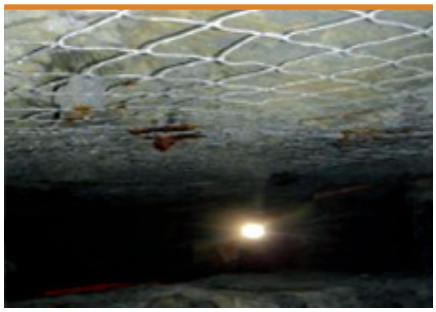
"The journey to full adoption of the in-stope netting was characterised by several challenges and lessons."

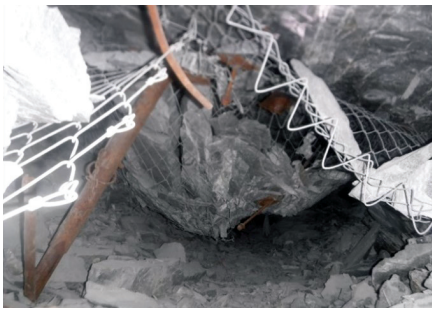
BENEFITS AND IMPROVEMENTS REPORTED BY AFFECTED STAKEHOLDERS

The introduction of permanent in-stope netting has led to a reduction in FOG accidents and incidents on the mine. The mine was 2,556,537 fatality-free shifts as at 31 May 2022.

Masimong Mine FOG accidents: 2013 – 2022







In-stope permanent netting installed with rock-studs and temporary mechanical jacks in a panel at Masimong Mine.

Raise line 1810 S13A centre gully hanging wall was supported with permanent mesh and tendons. Subsequent to the initial breast ledge blast, a significant FOG of 72 tonnes was suspended by the permanent mesh.

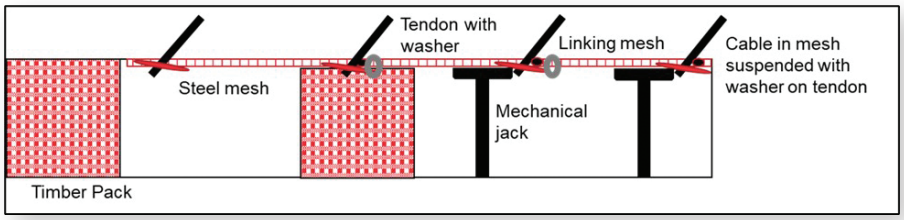
Permanent in-stope steel net arresting a seismic induced FOG following a magnitude 2.4 event at 1810 S12 E17 UD3 on 24 May 2022.

Hamony – Masimong

Hamony – Masimong

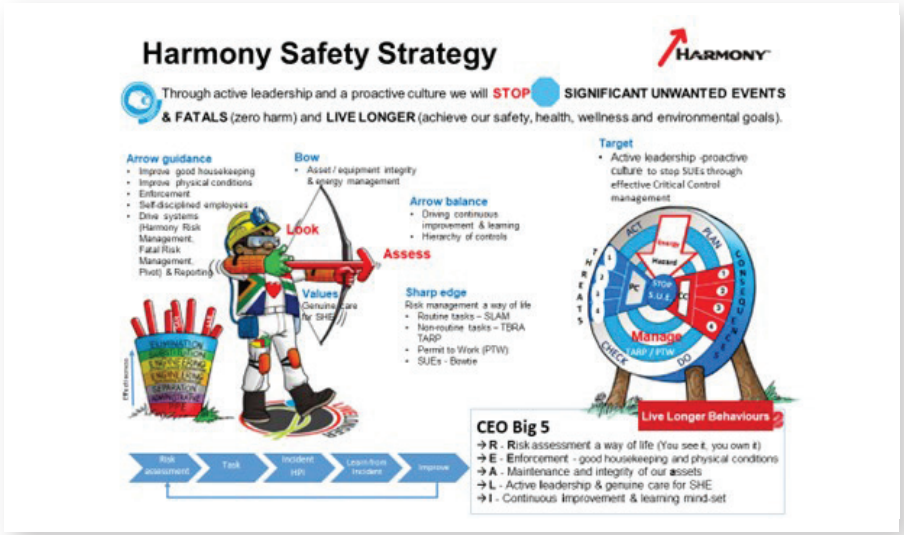
BENEFITS AND IMPROVEMENTS REPORTED BY AFFECTED STAKEHOLDERS CONTINUED

A schematic illustrating the installation of the permanent in-stope netting (section view – not to scale)**:**



Safety campaign on permanent mesh installation

Harmony Risk Management Safety Strategy



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