

# PureGRAPH® PERFORMANCE IN MINING EQUIPMENT

Liner products show increased strength and wear resistance of up to six times thanks to PureGRAPH® graphene products.

## Background

Sacrificial polymer liners are routinely used to protect steel mining equipment from wear and a typical lifetime for a liner is six months depending on equipment, ore type and process. Each polymer liner used to protect the steel buckets weighs about 200kg.

newGen Group are a mining services company that offers a range of turn-key wear protection systems for mining equipment. These include polymer and ceramic linings for leading mining companies such as BHP Iron Ore, Fortescue and Rio Tinto.

## The Collaboration

In June 2018, newGen and First Graphene Ltd commenced work on devising a technology that would provide a cost effective, more efficient way for mining companies to operate.

The collaboration was formed to develop rubber liners with improved wear properties through the incorporation of PureGRAPH® graphene additives. Initial studies were carried out on polyurethane-based liners, mixing PureGRAPH® graphene powders into the resin using standard industrial mixing equipment.

## Laboratory Trial

In laboratory trials, the initial study focused on tensile strength, elongation and abrasion resistance. Results are presented in Fig. 1. Analysis was carried out by an independent NATA accredited laboratory.

Typical %w/w Performance Increase

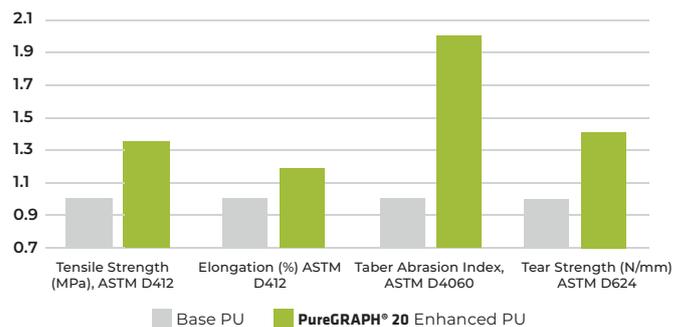


Fig. 1. Performance Results of PureGRAPH® enhanced Polyurethanes  
Analysis was carried out by an independent NATA accredited laboratory

## Field Trial

In field trials, two identical liners were installed on the same bucket wheel reclaimer: one containing a PureGRAPH® 20 enhanced Polyurethane and the other acting as a control (standard polyurethane). Both buckets were installed on the same reclaimer at a major iron ore processing facility in the Pilbara region of Western Australia. These liners were installed simultaneously and used continuously for 62 weeks. Upon removal, both liners were measured by an independent NATA accredited laboratory to determine the comparative wear rates. Results from this trial are shown in figures 2, 3.2 and 3.3.

Detailed thickness testing was carried out on each liner using an Elcometer 456 thickness gauge to determine a representative wear rate for each material. Thickness testing was performed on the rear sliding face of each bucket liner, as this surface was closely fitted to the steel structure bucket providing a more representative analysis of wear performance. Details on the measurement locations can be viewed in figures 4.1, 4.2 and 4.3.



# Outcome

Field trials confirmed the performance increases demonstrated in the laboratory testing. These results show a 6x reduction in average wear rate for a **PureGRAPH® 20** enhanced polyurethane compared to a standard polyurethane under equivalent processing conditions.

newGen Group has subsequently launched a range of wear protection liners under a newly created ArmourGRAPH™ brand. The ArmourGRAPH™ products are being introduced across mining and mineral handling operations including reclaimer bucket liners, pipe spooling, dryer chutes and conveyor applications.

The results from this case study represent a significant milestone for the mining industry with the possibility for longer lasting equipment, reduced downtime and increased overall efficiency of any operation.

Property	Standard PU Liner	PureGRAPH® 20 PU Liner
Trial length (weeks)	62	62
Throughput (tonnes)	1,621,219	1,621,219
Avg. abrasion loss (mm)	7.17	1.16
Max abrasion loss (mm)	8.90	2.2
Avg. wear rate (mm/Week)	0.12	0.019
Max wear rate (mm/Week)	0.14	0.035

Table 1. Field Trial comparative results produced by independent NATA laboratory.

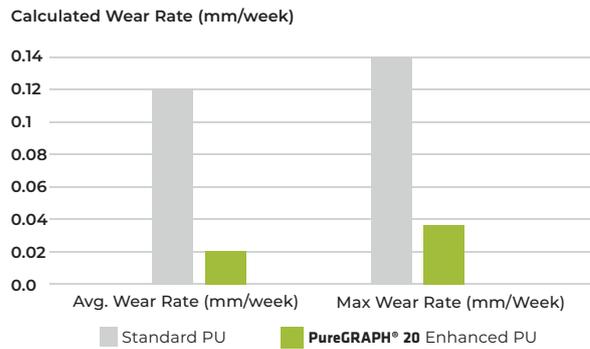


Fig. 2. Average and maximum wear rate results for PureGRAPH® enhanced Polyurethanes. Analysis was carried out by an independent NATA accredited laboratory

The technology has been developed in close collaboration with newGen Group, a specialist in wear protection and lining product design, and boasts many benefits to the mining and mineral handling industries. newGen Group has since launched a series of high performing wear protection products branded as ArmourGRAPH™.

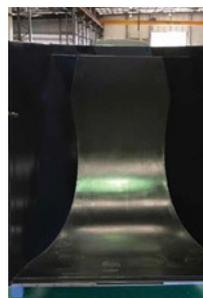


Fig. 3.1. Standard PU Liner



Fig. 3.2 Standard PU Liner after field trial



Fig. 3.3 PureGRAPH® 20 PU Liner after field trial



Fig. 4.1 Control Liner

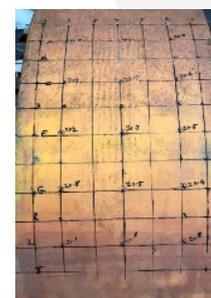


Fig. 4.2 Standard PU Liner



Fig. 4.3 PureGRAPH® 20 PU Liner

For more information on PureGRAPH® products please contact us at [info@firstgraphene.net](mailto:info@firstgraphene.net)

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