The best in hardfacing

POSTLE INDUSTRIES, INC.
CLEVELAND, OHIO - USA

POSTALLOY is an American trademark, from **Postle Industries, Inc**, (www.postle.com and www.tungstencarbidehardfacing.com). With headquarters in Cleveland, Ohio. Postle Industries has spent almost 40 years in the hardfacing and Reconstruction and Maintenance Welding industry. It has been innovating and leading the research and use of small diameter wires for hardfacing.

HARDFACING

OBJECTIVES - BENEFITS

Parts and equipment that are exposed to wear are subject to abrasion, impact and/or erosion. These external factors cause hundreds of tons of material to be lost and productivity that can never be recovered. This represents significant expenses to companies in the recovery or replacement of these wear prone elements.

Postle MIG Tungsten Carbide provides a solution

1. Increase the service life of parts that become worn (shovel tips and adaptors, blades, dredging teeth, mixing blades, hammers) from 200% to 800% more than conventional hardfacing alloys.
    - Mining Equipment – shovel and bucket wear parts, drilling parts
    - Highway and Road Construction Equipment
    - Trenching Equipment
    - Processing Equipment – mixing blades
    - Dredging Equipment – cutter heads and teeth
    - Recycling Equipment – hammers and other wear parts

2. Improve productivity by keeping wear parts sharp and maintaining physical dimension tolerances.

3. Reduce expenses caused by frequent maintenance interruptions and downtime.

4. Reduce the cost of replacement parts

WHAT IS MIG-TC?

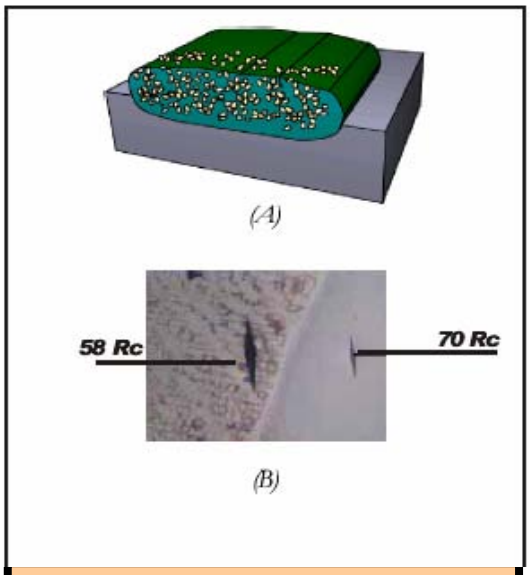
- MIG Tungsten Carbide utilizes the **MIG** welding process along with PS98 hardfacing wire and Tungsten Carbide particles to form a composite hardfacing that is highly resistant to severe abrasion and impact. It is made from extremely hard tungsten carbide particles (70Rc), deposited in a specially designed tool steel weld matrix – Postalloy PS-98WC at 58 Rc.
- The tungsten carbide particles are held in a hopper located directly above the welding operation. Immediately upon beginning to weld, the TC particles are dropped through a tube that is attached to the MIG gun nozzle and then feed directly into the molten PS98 matrix weld.
- **MIG-TC** offers a tremendous increase in service life compared to parts that do not have it.

HOW TO GO ABOUT IT?

- To decrease the material lost from the wear prone parts, the critical areas should be hardfaced with MIG Carbide according to the material that the wear prone part will be working with.

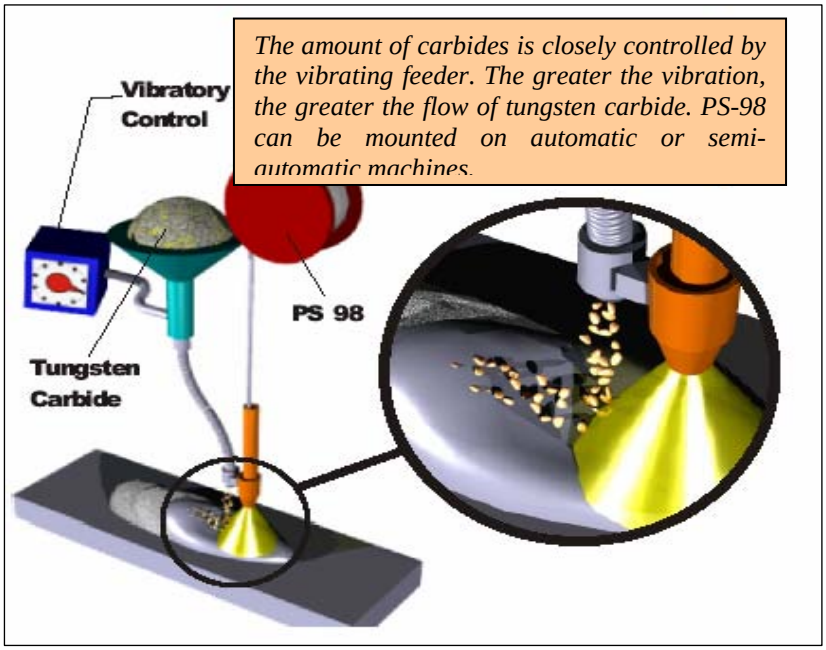
The material used as hardfacing – Tungsten Carbide with PS98 - will have hardness greater than the material causing the wear. This significantly decreases the loss of material from abrasive wear.

Hardfacing Weld Deposit
PS98 hardfacing wire matrix with tungsten carbide



(A) Typical encapsulation of tungsten carbide with the PS-98 special formula. Carbide distribution through the entire deposit.
(B) *Micro hardness of tungsten carbide (70 Rc) and in the PS-98 matrix (58 Rc). The latter provides*

Vibratory Feeder and Control



The amount of carbides is closely controlled by the vibrating feeder. The greater the vibration, the greater the flow of tungsten carbide. PS-98 can be mounted on automatic or semi-automatic machines.

Postalloy® Mig Tungsten Carbide
Data Sheet

HARDFACE TECHNOLOGIES by POSTLE INDUSTRIES

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Mig TUNGSTEN CARBIDE

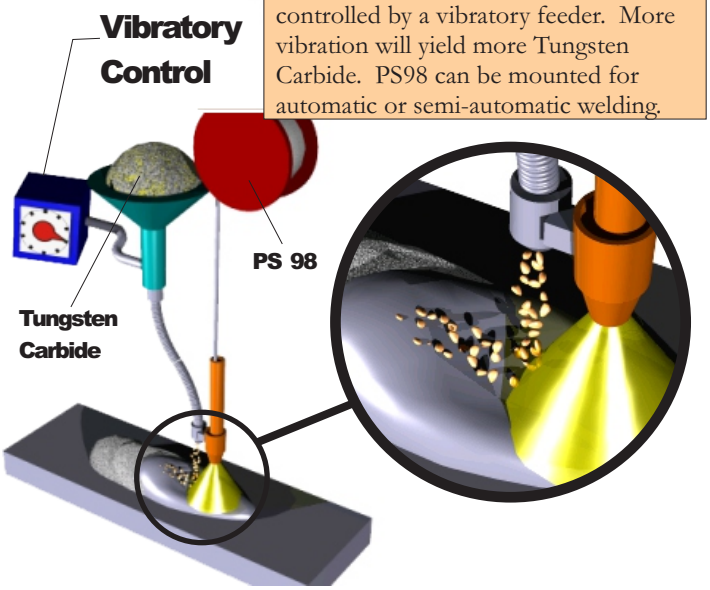
The Ultimate in Abrasion Resistance

For severe abrasion, the Tungsten Carbide Embedding hardfacing process with Postalloy PS98 Tool Steel Matrix Wire offers the ultimate in wear and abrasion protection and is economical to apply. It consists of a vibratory feeder and a standard semi-automatic MIG Gun, that delivers metered Tungsten Carbide particles to a molten weld pool at precisely the right moment prior to the puddle freezing. The result is a weld deposit filled with Tungsten Carbide surrounded in a 58 Rc tool steel matrix.

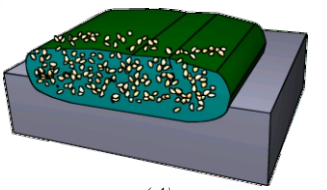
While chromium carbide has served industry adequately for many years, more recent production demands on parts and equipment have dictated a harder, more wear resistant solution. MIG Carbide Embedding with PS-98 offers 2 to 8 times better wear life than typical hardfacing alloys and can be deposited at 1/3 the cost of tungsten carbide hardfacing wires.

Typical equipment that can benefit from MIG Carbiding are mining and construction equipment, dredging equipment, mixing, blending, shredding and processing equipment, drill bit and equipment, agricultural parts.

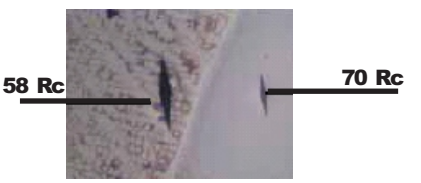
Bucket tooth gets new life with MIG TUNGSTEN CARBIDE.



Tungsten Carbide volume is closely controlled by a vibratory feeder. More vibration will yield more Tungsten Carbide. PS98 can be mounted for automatic or semi-automatic welding.



(A)



(B)

(A) Typical capture of Tungsten Carbide with special formulation PS 98. Even distribution of carbides throughout the deposit.

(B) Microhardness of Tungsten Carbide particle (70Rc) and PS 98 (58Rc) matrix. The hard matrix provides maximum wear properties to the final deposit.

Tungsten Carbide / Postalloy PS 98

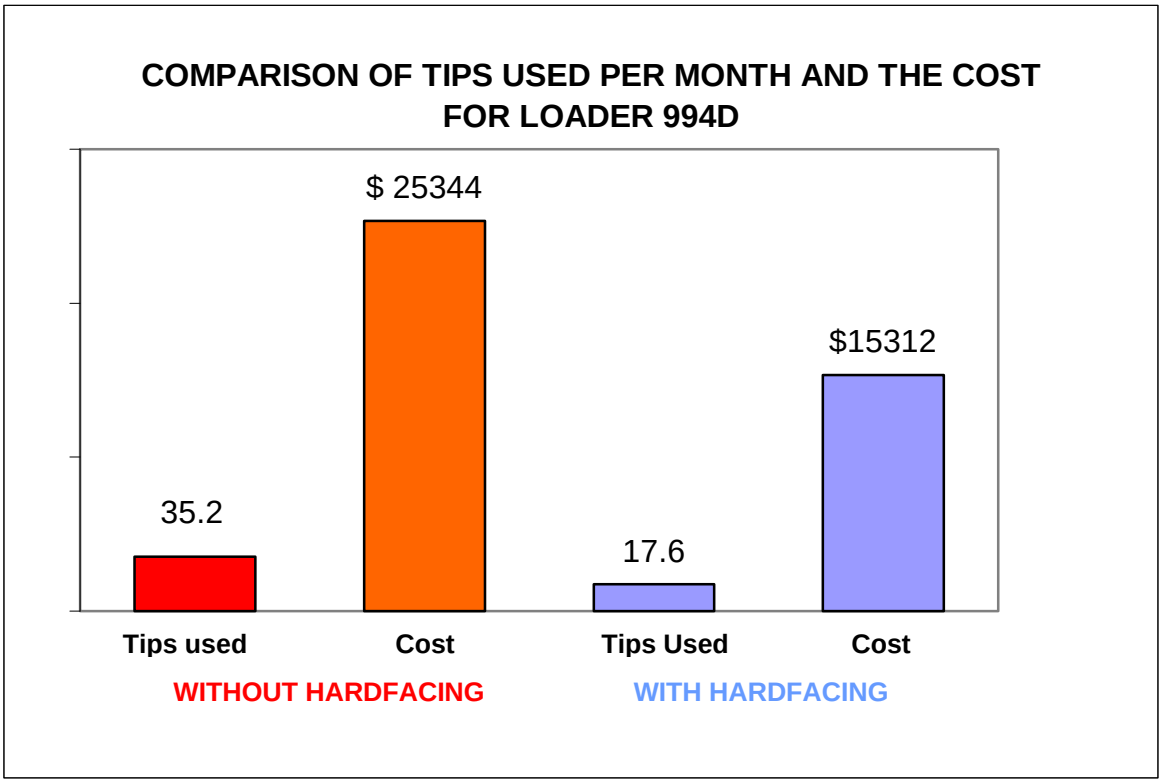
Application of **MIG TUNGSTEN CARBIDE** on loader and shovel tips enables them to be kept in service longer, resulting in more productivity

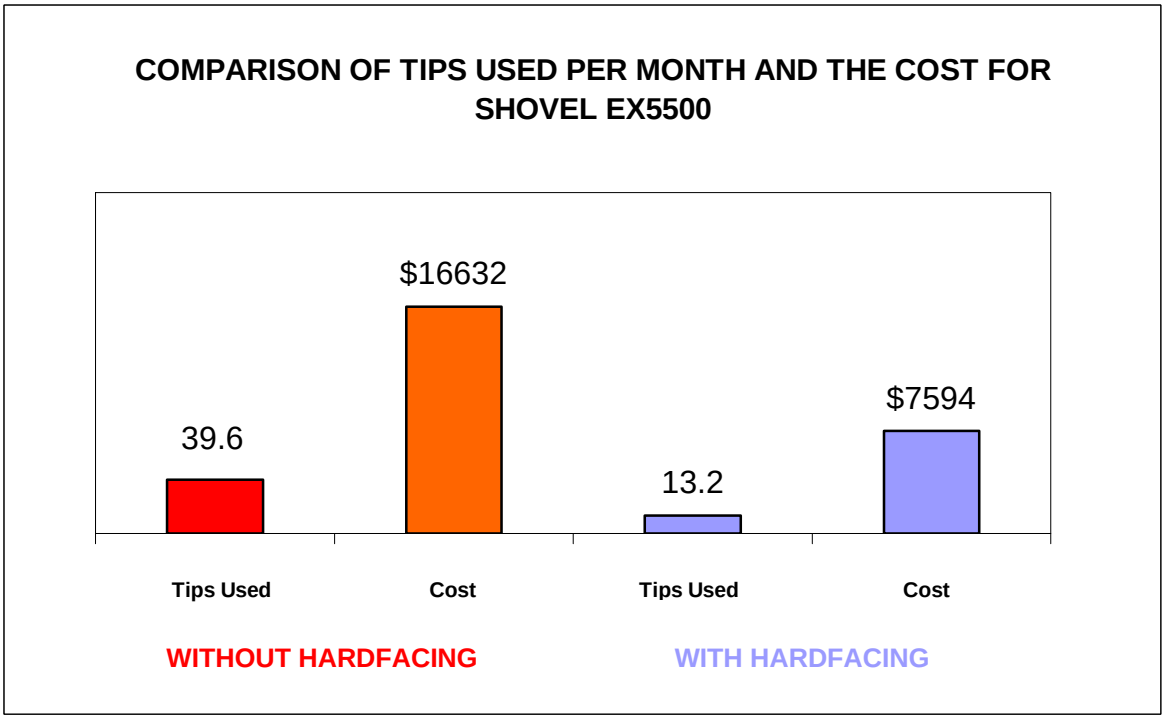
Shovel EX5500 Hitachi used at Yanacocha Mines

ESTIMATED COSTS AND SAVINGS

Tool/ Equipment	PRICE PER TIP ($)		SERVICE LIFE Hours		TIPS USED/MONTH		COST/MONTH		$$$ SAVINGS
TIPS	New without MIG-TC	MIG Tungsten Carbided	New without MIG-TC	MIG Tungsten Carbided	New without MIG-TC	MIG Tungsten Carbided	New without MIG-TC	MIG Tungsten Carbided	MONTH
SHOVEL EX5500	$420	$570	100	300	39.6	13.2	$16632	$7524	$9108
LOADER 994D	$720	$870	150	300	35.2	17.6	$25344	$15312	$10032

COMPARING THE COST OF PARTS PUT IN SERVICE WITHOUT HARDFACING AND WITH MIG TUNGSTEN CARBIDE

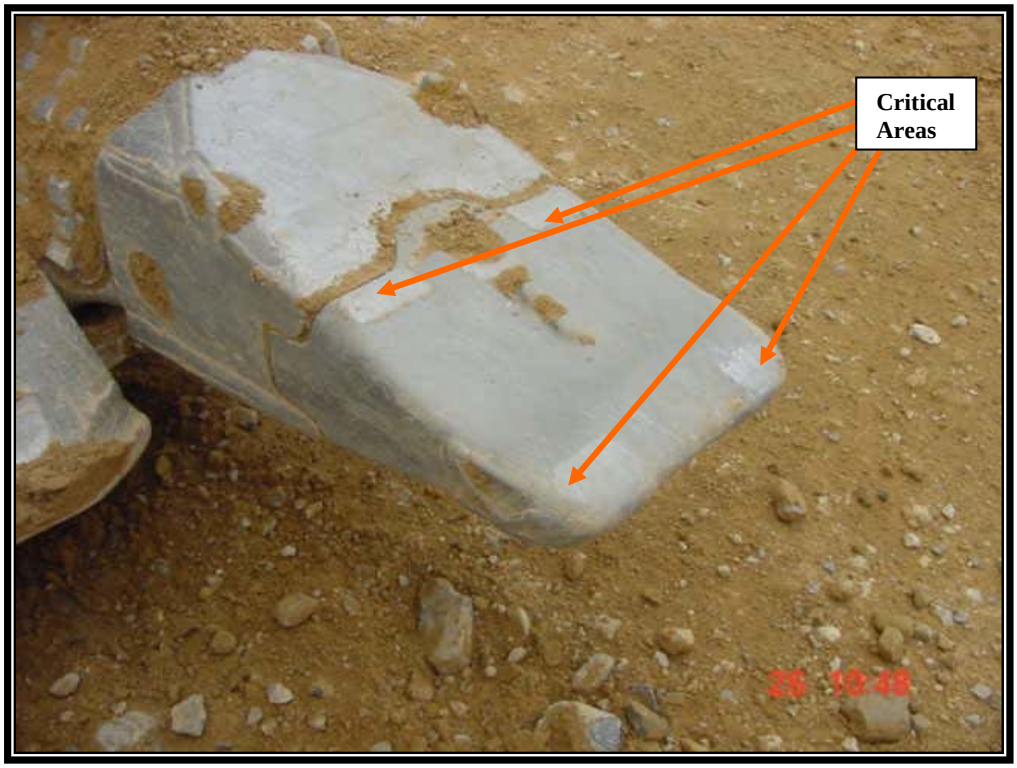




Source: Yanacocha Mines

SHOVEL TIP PROTECTION

ESCO Shovel Tips before being coated
Yanacocha Mines



ESCO shovel tip placed in operation at 60 hours of life
Yanacocha Mines

LOADER TIP FACING

Mass hardfacing process with tungsten carbide on Loader Tips CAT 994 belonging to Yanacocha Mines. Urteaga EIRL factories

Loader tip ready to be put into operation. Work carried out at Urteaga EIRL factories

LIP PROTECTION

ESCO lip protector before being hardfaced with MIG Carbide
Yanacocha Mines

The same ESCO lip protector ready to be put into operation
Yanacocha Mines

FREQUENTLY ASKED QUESTIONS

Does the MIG-TC hardfacing application change the properties of the base metal? Will it be softer? When the tungsten carbide/PS98 hardfacing wears away, will the base metal parts wear more quickly?

That is what many of our competitors would like to believe. However, several metallurgical analyses have been conducted. They show that the heat affected area (HAZ) is around 1 mm right below the hardfacing's matrix. The HAZ has the same hardness as the base metal.

Do I need to invest in a big infrastructure to be able to apply this technology?

No. In fact, you only need a standard welding machine for MIG and the carbide feeder, plus tungsten carbide and PS98 matrix wire. Of course, we provide to the necessary technical support for your application.

What is the longest service life that products coated with MIG-TC have attained?

This is a hard question to answer because there so many variables, especially in hardfacing cutting edges, blades and parts exposed to wear from abrasion, impact, erosion, etc. Generally, an increase in wear life of 6 to 10 times can be expected for parts that are not hardfaced. Wear parts that are currently being hardfaced can expect a 3 to 6 times improvement in wear life.

ADVANTAGES OF HARDFACING

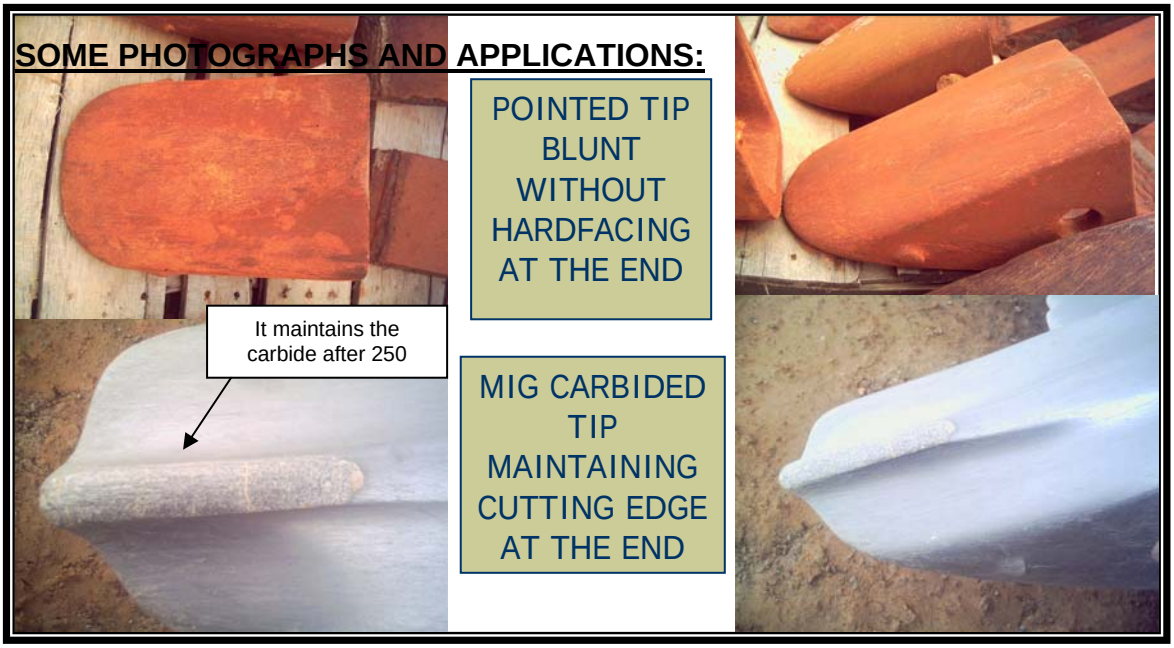
- **LONGER SERVICE LIFE** – Fewer replacement parts are needed when parts are hardfaced with MIG Tungsten Carbide.

- **HIGHER PRODUCTIVITY -** Upon improving wear life with MIG-TC, this contributes to the equipment working and producing more per hour. This increases the productivity and therefore your profits.

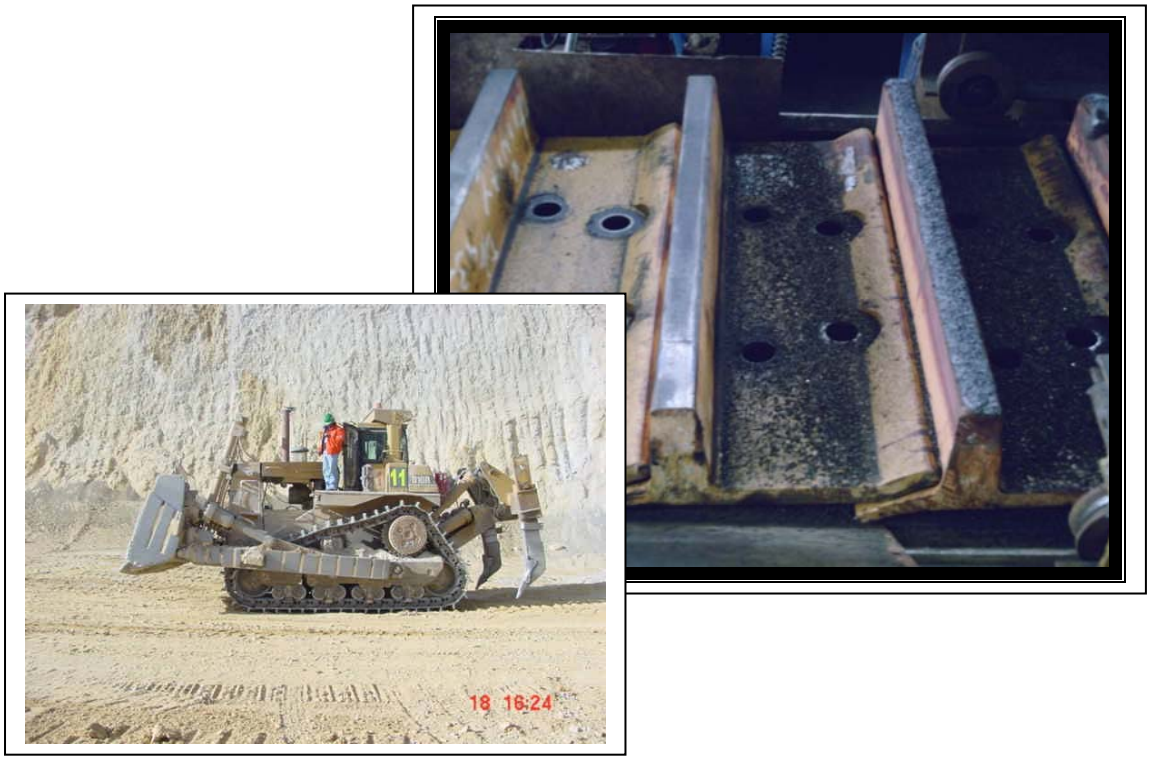
- **LESS DOWNTIME - GREATER AVAILABILITY OF MACHINE** - a longer service life means that it will you will spend less time replacing the tips. This contributes to a reduction in total operating costs.

“POSTALLOY IS YOUR SOURCE AND RESOURCE FOR HARDFACING PRODUCTS AND PROTECTION TECHNOLOGIES”

SOME PHOTOGRAPHS AND APPLICATIONS:



BULLDOZER GROUSER BARS
MIG TUNGSTEN CARBIDE AND PS98 HARDFACING WIRE



Drill Bit Chuck for “Down the Hole” Hammer Rock Bits
ready to be put into drilling operation.

Blades (graders and bulldozers with MIG TUNGSTEN CARBIDE work more efficiently in high abrasion and impact applications.

Motor Grader blade
Yanacocha Mines

UNDERGROUND CONTINUOUS MINER WEAR SHOES