STULZ-SICKLES STEEL COMPANY

SINCE 1916

CREUSABRO®

The Next Generation of wear resistant steels

We'll Wear Out

Your Rocks

STULZ-SICKLES STEEL COMPANY
Burlington, New Jersey
800-351-1776
www.stulzsicklessteel.com

MANGANAL STEEL SALES
Colton, California
800-572-5809
www.manganal.com

STULZ-CREUSABRO 4800

A Modern Solution to Wear

Significantly Better Wear Resistance than AR400 due to TRIP Effect

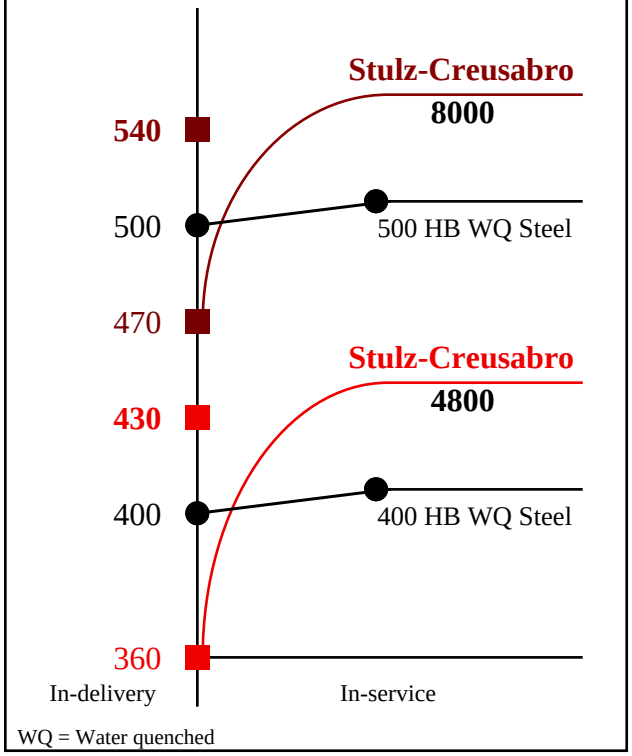
TRIP Effect (TRansformation Induced by Plasticity)

WORK HARDENS
Fully Austenitic
Creates an Active Surface
Ensures a Sustained Work Life

TITANIUM CARBIDE MICROSTRUCTURE
Reduces Chip-Off and Cracking
Resists both Impact and Abrasion

OIL QUENCHED
True Throughout Hardness
Better Flatness
Easy Machining and Processing

Typical Hardness (HB) Chart



WQ = Water quenched

Titanium Carbides

In addition to the fine and homogeneous distribution of chromium and molybdenum carbides (respectively 1500 HV and 1800 HV) common to Stulz-Creusabro steels, Creusabro® 4800 is a new generation steel in the field of wear resistance steels with a significant addition of Titanium resulting in the formation of a structure with very hard particles of titanium carbide, TiC reaching a hardness level of 3200 HV. These carbides give to the steel an increased wear resistance.

400 HB water quenched	Creusabro® 4800
Conventional route Passive material	Innovative route Active material
Just connected to supplied hardness	Combining: • in service hardening • TRIP effect • Microcarbides + Titanium effect
⇓	⇓
PASSIVE STEEL	**REACTIVE STEEL**
• Low alloyed steel (C, MN, B) • Water quenching	• Specific addition of alloying elements (Cr, MoB, Ti...,) • Controlled cooling rate

CHEMICAL ANALYSIS - % WEIGHT

C	S	P	Mn	Ni	Cr	Mo	Other elements
≤ .20	≤ .010	≤ .020	≤ 1.60	≈ .80	≤ 1.90	≤ .40	Ti ≤ .200

STULZ-CREUSABRO 8000

A Modern Solution to Wear

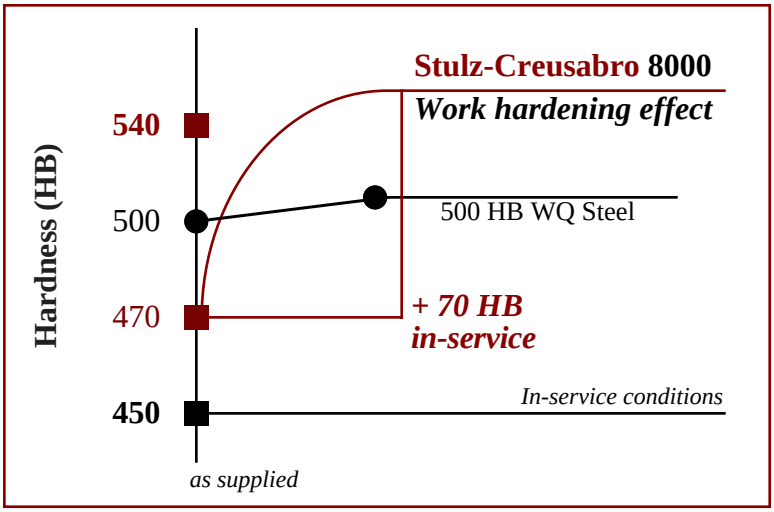
SIGNIFICANTLY BETTER WEAR RESISTANCE THAN AR500 DUE TO TRIP EFFECT

TRIP Effect (TRansformation Induced by Plasticity)

WORK HARDENS
Fully Austenitic
Creates an Active Surface
Ductile Interior
Ensures a Sustained Work Life

TITANIUM CARBIDE MICROSTRUCTURE
Reinforced Cell Structure
Reduces Chip-Off and Cracking
Eliminates Cracking

OIL QUENCHED
Excels where Severe Abrasion, Impact & High Heat are Factors
Easy Machining and Processing
Sensitive to Strain Hardening



500 HB water quenched steel Conventional route Passive material	Creusabro® 8000 Alternative route Active steel
» Restricted alloy elements (mainly C, Mn, B)	» Specific chemical composition » Controlled cooling (oil quenching)
» Drastic water quenching ⇓	⇓
» Fully martensitic structure	» Mix macrostructure: martensite + bainite + retained austenite » Perfect balance : high wear resistance + improvement workability » Wear resistance in service is a combination of: –» work-hardening effect (TRIP phenomenon) –» Presence of micro-carbides (chromium, molybdenum, titanium) –» Delayed tearing of metal particles (super-ductility of the retained austenite).
Wear resistance in service is a result of the hardness in the as-delivered state. It is an answer for common applications.	*Stulz-Creusabro 8000* is an answer for intense, specific applications.

Service life of *STULZ-CREUSABRO 8000* versus 500 HB steels

Mines	External liner of excavator	+ 100%
Foundry	Extracting plates	+ 36%
Quarry	Cheek plates in crusher	+ 50%
Wood	Crushing hammers	+ 38%

CHEMICAL ANALYSIS - % WEIGHT

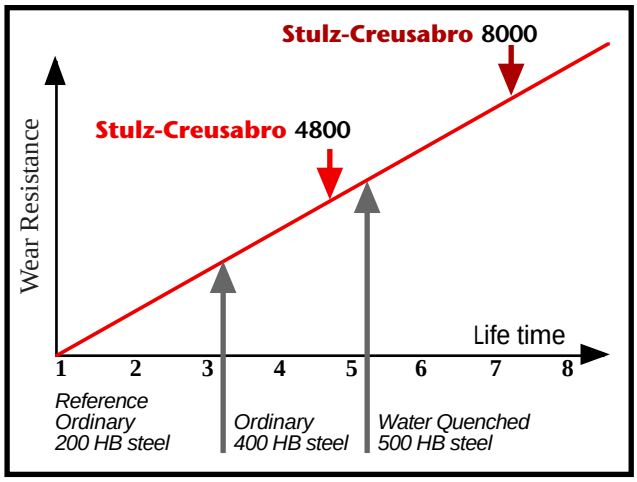
C	S	P	Mn	Ni	Cr	Mo	Other elements
≤ .28	≤ .005	≤ .015	≤ 1.60	≤ 1.0	≤ 1.60	≤ .40	

Technical specificities of *STULZ-CREUSABRO* 4800 and 8000

Lifetime is increased

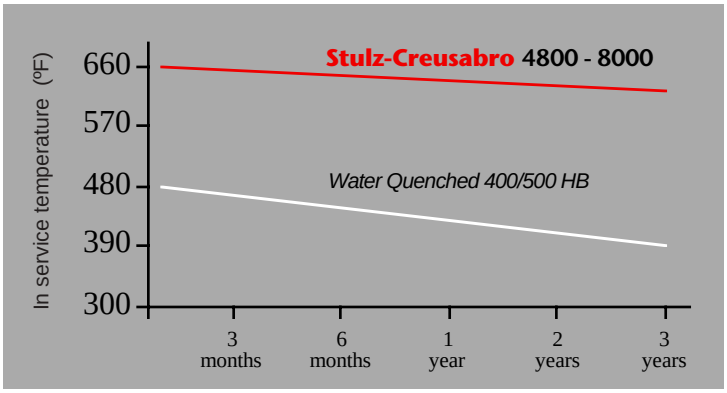
Against conventional water quenched steels, wear resistance of ***STULZ-CREUSABRO*** grades is increased and maintenance costs reduced.

Usually, choice of material is made on a price and hardness basis. However, users have to face difficulties of wear parts replacement. One must therefore add to the material price both the **costs of maintenance and production downtime,** in order to establish the **true cost-effectiveness** of a material.



Resistance to high temperature is guaranteed...

... which allows the use of ***STULZ-CREUSABRO*** grades in high conditions (≤ 450ºC - 840ºF) such as met in **Cement Works, Foundries, Steel Industry, Asphalt Plants...**



STULZ-CREUSABRO 4800

Typical 360 HB –» Work harden to ≥430 HB

Delivery condition : Guaranteed 340/400 HB

STULZ-CREUSABRO 4800 is ideal for applications in mines and quarries, cement and the steelmaking industries, public works and agricultural machinery. It is suitable for all types of abrasion, sliding or impact, dry or wet media including high temperature abrasion.

STULZ-CREUSABRO 8000

Typical 470 HB –» Work harden to ≥540 HB

Delivery condition : Guaranteed 430/500 HB

STULZ-CREUSABRO 8000 is known as the best compromise for severe applications where exceptional abrasion, impact, heat and moderate corrosion are requested in service. It is currently used in Mining, Quarries, Cement and Concrete industries, Asphalt Plants, Steel Recycling, Earthmoving, Dredging...

"TRIP effect"

TRansformation Induced by Plasticity

Due to its initial structure not fully martensite (a mix of martensite, bainite and retained austenite), *STULZ-CREUSABRO* has the ability to work-harden when submitted to local plastic deformation induces a surface hardening phenomenon by transformation of retained austenite into fresh and very hard martensite while the material remains ductile underneath, makes it a most effective to withstand both abrasion and heavy impact in service.

Liebherr Abrasion Test Program

This major manufacturer of heavy equipment put ***STULZ-CREUSABRO 8000*** to the test in the ***Assarel Copper Mines in Bulgaria***.

Typically 400 & 500 water-quenched steel is used on the 771 Shovel bucket.

STULZ-CREUSABRO 8000
6 months in the wet season

After 2600 hours:
NO MAINTENANCE NEEDED

After 3,700 hours:
ONLY CLEANING AND BUILDUP NEEDED

400/500 HB Water-Quenched steel
6 month in the dry season

After 2540 hours:
SEVERE WEAR, REQUIRING REBUILD

Rock Crusher Hopper Panel
STULZ-CREUSABRO 8000

Excavator Rebuild with
STULZ-CREUSABRO 4800

Use ***STULZ-CREUSABRO 4800 and 8000*** throughout crushers and screeners

Most Effective Low-Hydrogen Welding Electrode

STULZ-SICKLES SPECIAL ALLOY

83/18 • Ductile • Rod or All-position Wire

ALLOWS WELDS TO FLEX AND REMAIN STRONG UNDER HIGH STRESS!

Use on our ***STULZ-CREUSABRO 4800*** *and* ***STULZ-CREUSABRO 8000***

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***Stulz-Sickles Steel* and *Manganal Steel Sales* offer hands-on, full service at your site.**

Call your local District Manager to have us come out and help solve your wear issues.

MEASUREMENTS • TEMPLATES • CUT DESIGNS
PLATE USAGE • MACHINING NEEDS