Introduction to PSB27

PSB27

Only from SB Specialty Metals

Your **First Choice** for Specialty Metals

- Spray Form technology
- The Evolution of Particle Metallurgy tool Steels and High Speed Steel
- Streamlined Powder Metallurgy process
- Higher wear resistance
- Improved toughness and chip resistance

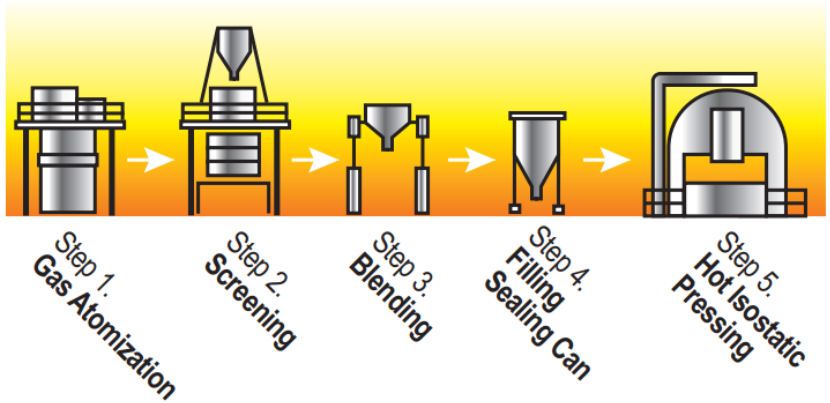
The Spray Form Process

The technology for tool steel production has evolved.

Conventional Production → Ingot

EVOLUTION #1

HIP'd Particle Metallurgy



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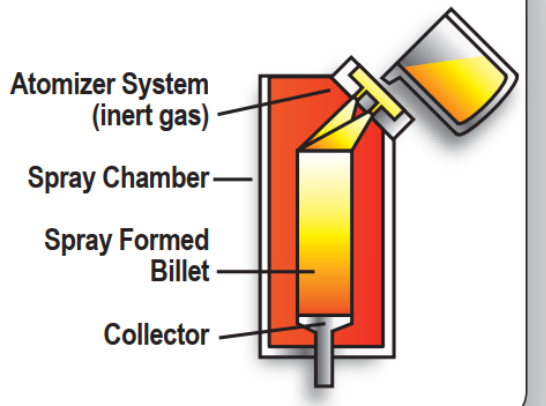
EVOLUTION #2

Spray Form Particle Metallurgy



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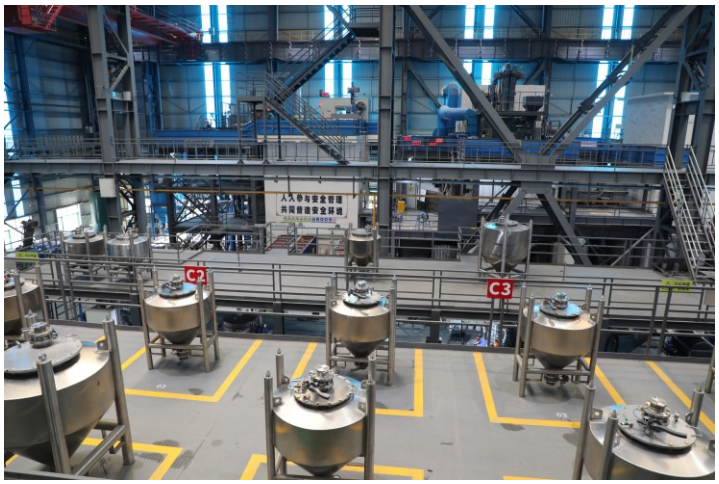
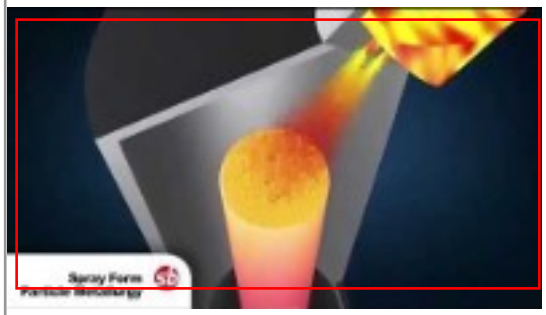
Steel Mill built in 2018 for Spray Form



Spray Form Ingot

Click below to see a video animation

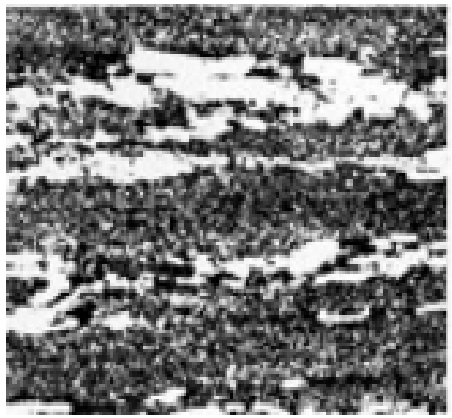


Microstructure

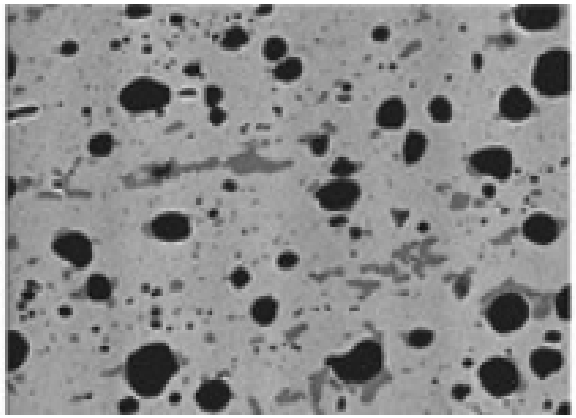
Steel Structure

PM steel processes result in uniform structures and homogeneous carbide distribution.

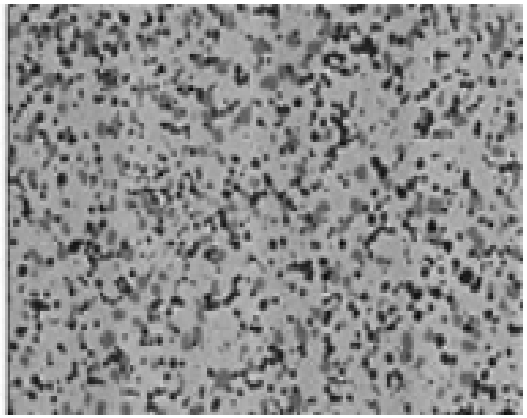
PM Steels offer properties above and beyond conventional steel making capabilities.



Conventional



Sprayform PM



HIP'd PM

Advantages of Particle Metallurgy

- Very uniform/homogeneous microstructure
- Improved mechanical properties –
  - Wear resistance
  - Toughness
  - Increased hardness
- Freedom from macro-segregations
- Improved dimensional stability in heat treatment

PSB 27

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PSB27 – Technical Data

General Description:

PSB27 is a premium spray formed D2 tool steel. It is ideal for many cold work applications requiring higher toughness and higher wear resistance than conventional D2. The spray forming process results in improved toughness and chip resistance compared to conventionally produced tool steels. PSB27 has 3 X the wear resistance of conventional D2.

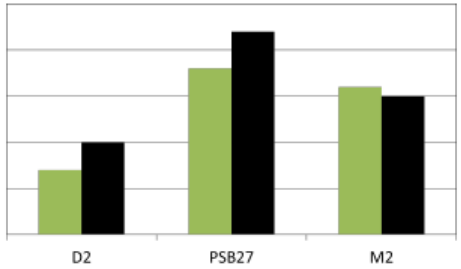
Example of applications:

Rotational Cutting Dies, forming rolls and dies, thread roll dies, blanking dies and punches, injection screw components, industrial knives and cutlery knives.

Chemical Composition

Carbon	Molybdenum	Vanadium	Chromium	Silicon	Manganese
1.50 - 1.60%	0.65 - 0.80%	0.75 - 0.90%	11.00 - 12.50%	0.40 - 0.50%	0.30 - 0.45%

Comparison Chart ■ Wear Resistance ■ Toughness



Typical Heat Treat Response

Hardening Temp °F	Tempering Temp °F	Hardness HRC	Charpy C-Notch Ft-lbs
1900	400	61	24
	500	60	26
	650	59	25
	800	58	24
	950	61	23

Size Changes During Hardening

Hardening Temp °F	Tempering Temp °F	HRC	Longitudinal Size Change %
1900	500	60.5	+.03%
1900	950	61	+0.04%

Surface Treatment

Standard surface treatments such as nitriding, titanium-nitride coating, or hard chrome plating can be used. Prior to nitriding or PVD treatment, must double temper at or above process temperature.

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PSB27 – Technical Data

Heat Treatment

Annealing

Heat to 1600°F, hold for two hours.
Slow cool 25°F/hour to 1000°F.
Then air or furnace cool to room temperature.

Stress Relieving

Normally performed after machining to minimize distortion in heat treating.
1100/1200°F, hold two hours.
Then air cool to room temperature.

Hardening

Salt bath, protective atmosphere, or vacuum furnace equipment preferred.

High Heat (Austenitizing)

Preheat to 1350-1400°F - let part equalize. Then austenitize at 1870/1900°F for a minimum of 30 minutes at austenitizing temperature.

Quench

Salt bath quench to 1000-1100°F, equalize, then air cool to 150°F.
Vacuum or atmosphere quench rate of a minimum 50 °F per minute down to 1200 °F is critical to achieve best heat treat response.
Temper immediately following quench.

Tempering

Minimum 400°F tempering temperature required.
Double tempering is required, triple tempering recommended.
Air cool to room temperature between tempers.

Physical Properties

Modulus of Elasticity	30 PSI x 10^6 .....(207GPa)	**Density**	0.283 lb/In^3
Annealed Hardness	215-255 Brinell Hardness (BHN)	**Machinability**	90% of D2

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Applications

- Non-woven industry
- Rolling - steel processing industry
- Recycling industry
- Slittering
- Blanking and Forming
- Steel Stamping
- Cutting
- Powder Compaction
- Brick Forming
- Sand blasting
- Threading
- Forming autoparts

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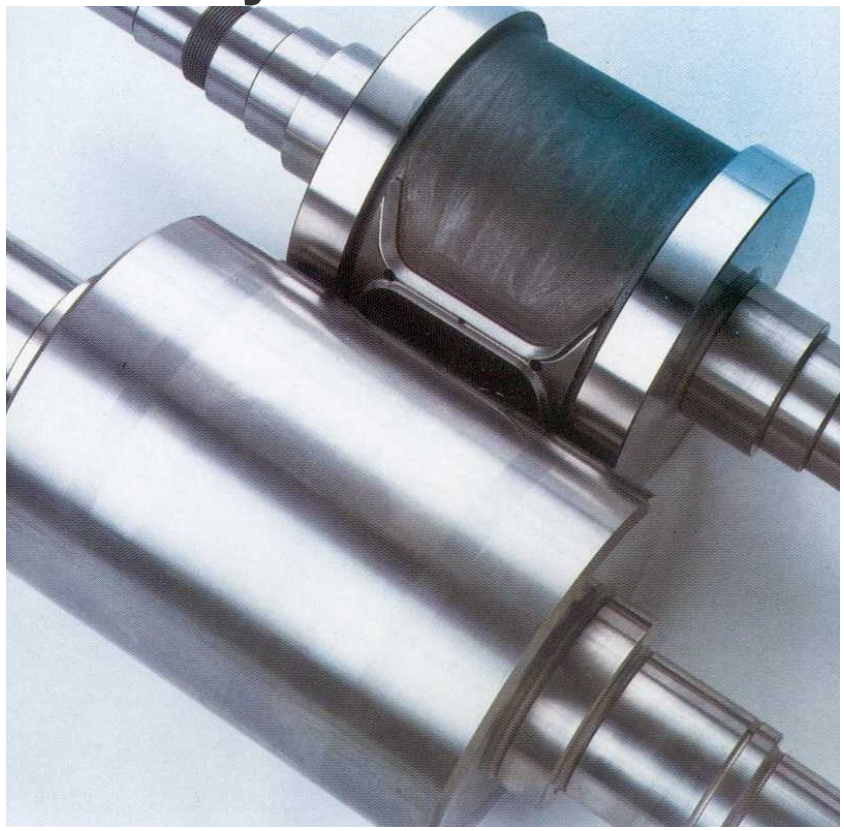
Case Study - Rotary Die Cutting Non-woven Material – Die for a pad machine final cutter.

10” Diameter Rotary Die

	PSB 27	Conventional D2
Production	84 million	34 million
Condition	No indications of microcracks	Micro Crack indications

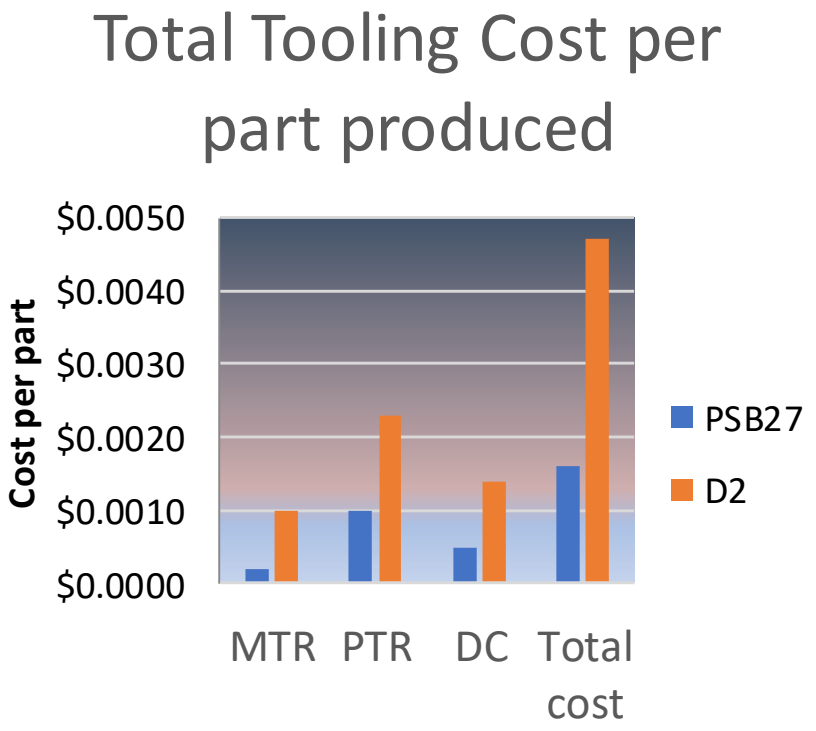
Rotary Crush Die



Financial Benefits Model

Total Lifecycle Model- Rotary Die – Non-woven

	PSB27	Conv. D2
Material Price (Per mm)	$ 600.00	$ 300.00
Machining + Grinding	$ 5,000.00	$ 5,000.00
Coating	0	0
Heat Treatment	$ 120.00	$ 120.00
other	0	0
Lifecycle Cost of the Materials (LC)	**$ 5,720.00**	**$ 5,420.00**
Usable Height in mm (UH)	5	5
Material Costs/mm (MC)	$ 1,144.00	$ 1,084.00
Trip Length (Prod. Amount (Unit)/regrind = TL)	975,000.00	325,000.00
Standard Grind Off in mm (SGO)	0.15	0.30
Productive Performance	6,500,000.00	1,083,333.00
Material Related Costs/Produced unit (MTR)	**$ 0.0002**	**$ 0.0010**
Grinding Costs	$ 700.00	$ 500.00
Tooling Transport Cost	$ 50.00	$ 50.00
Changes of tooling	$ 200.00	$ 200.00
Recoating	$ -	$ -
Other	$ -	$ -
Total Regrind cost	$ 950.00	$ 750.00
Processing Cost/Produced Unit (PTR)	**$0.0010**	**$0.0023**
Downtime costs (DC)	$ 450.00	$ 450.00
Downtime related costs/Produced Unit	$ 0.0005	$ 0.0014
Total Cost per produced unit	**$ 0.0016**	**$ 0.0047**



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Case Study - Cutting wallpaper structured with wood fibers

16” Dia x .183 Cutting Wheel

	PSB27	Conventional D2
Run time before regrind	360 hours	240 hours
Tool hardness	60 HRC	

Additional notes from study

PSB27	Conventional D2
The production down time was reduced due to a keener edge on the knife, resulting in less maintenance time	Several production stoppages due to blockages of weed fibers between knife.

Case Study – Threading Die

Die Life

	PSB27	Conventional D2
Hardness	63 HRC	61 HRC
Die Lifetime	600 hours	200 hours

Die photo