DC53

Re·vo·lu·tion

Medium Chrome Tool Steel

Revolutionize your tooling

The High Performance Alternative for:

- **Punches & Dies**
- **Draw & Form Dies**
- **Shear Blades**
- **Shredder Knives**
- **Thread & Form Rolls**
- **Cold Heading Dies**
- **Mill Rolls & Slitters**

Features

- Uniform distribution of Fine Carbides
- Excellent Galling & Wear Resistance
- Exceptional Toughness & Fatigue Resistance
- High Temper Resistance to support PVD & Nitride surface treatments
- Machining & Grinding Characteristics Superior to most other tool steels
- Rounds 1/4" to 20"
- Flats 1/2" to 12" thick in widths up to 24"

DAIDO STEEL

DC53 is distributed by International Mold Steel, Inc. A Daido Partner Company.

INTERNATIONAL MOLD STEEL, INC.

6796 Powerline Dr. • Florence, KY • 41042
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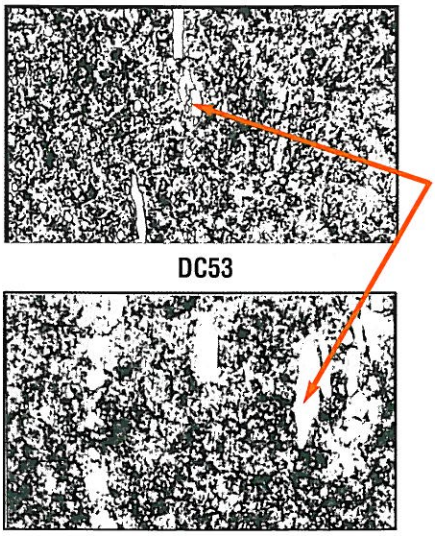
DC53

DC53 is a general purpose cold work tool steel with exceptional Toughness, Wear Resistance, Compressive Strength and Temper Resistance. These properties are obtained through its chemistry as well as its unique manufacturing processes of ladle refinement, vacuum degassing and forging methods. DC53 also has excellent machining characteristics and is well suited as a sub-straight for PVD surface treatments. DC53 can also be hot process CVD and TD (Thermal Diffusion) coated however post heat treat is generally recommended.

Chemical Composition %

C	Si	Mn	Cr	Mo	V
0.95	1.0	0.4	8.0	2.0	0.3

Annealed Hardness (BHN)	210-225
Specific Gravity (g/cm3)	7.76
Density (lb/Inch3)	.2793
Young's Modulus (E)	21,700
Modulus of Rigidity (G)	8,480
Poisson's Ratio	0,28



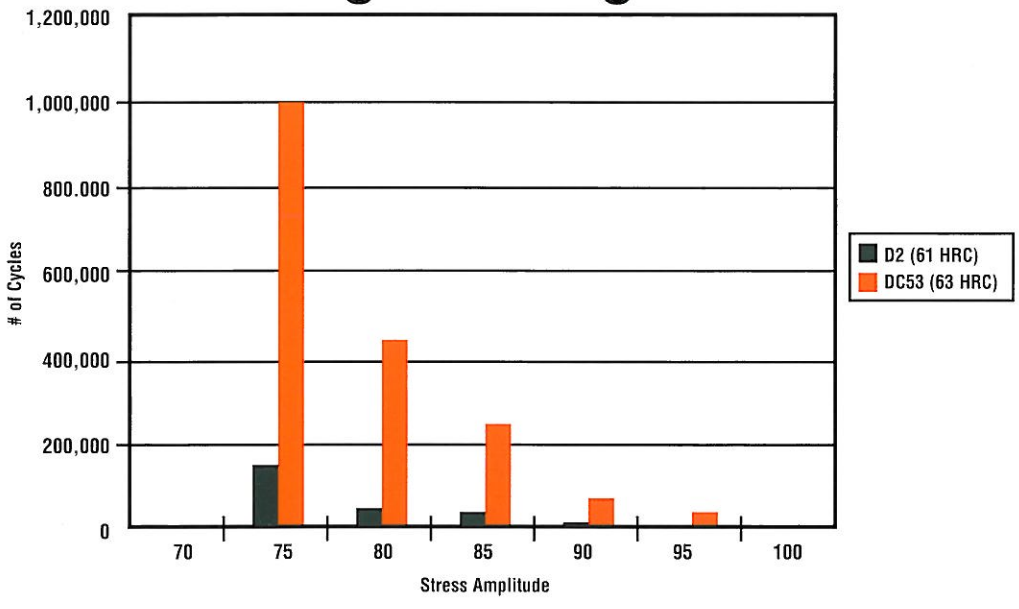
DC53

D2

Primary Carbides

Primary carbides in DC53 are relatively small with highly uniform distribution as compared to other tool steel grades such as D2. This helps to provide DC53 with it's superior toughness, and fatigue resistances.

Fatigue Strength



Fabrication Characteristics

Machining

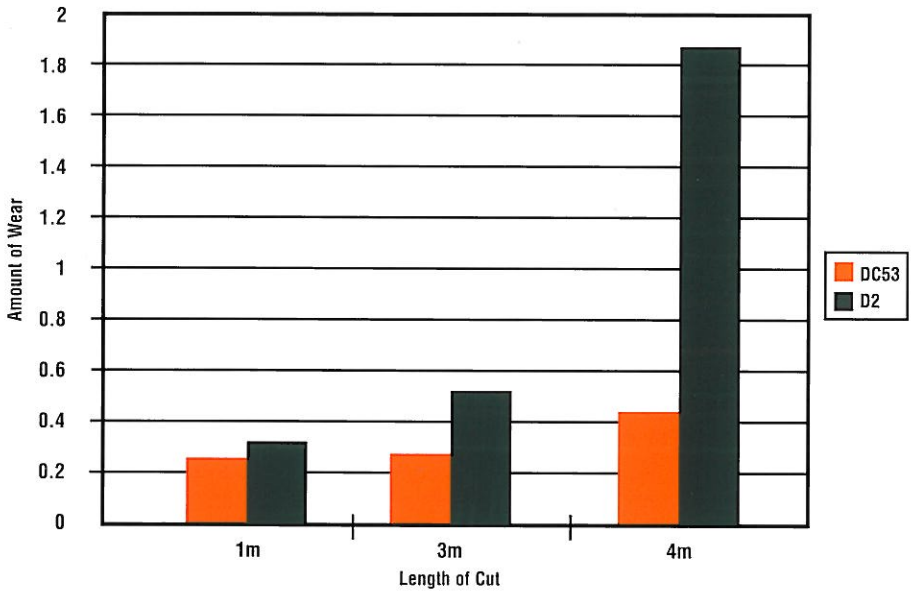
Cutting Speeds for DC53 in Surface Feet per Minute

OPERATION	HSS TOOLS	CARBIDE TOOLS
Turning	70 SFM	235 SFM
Drilling	50 SFM	150 SFM
Milling	55 SFM	195 SFM

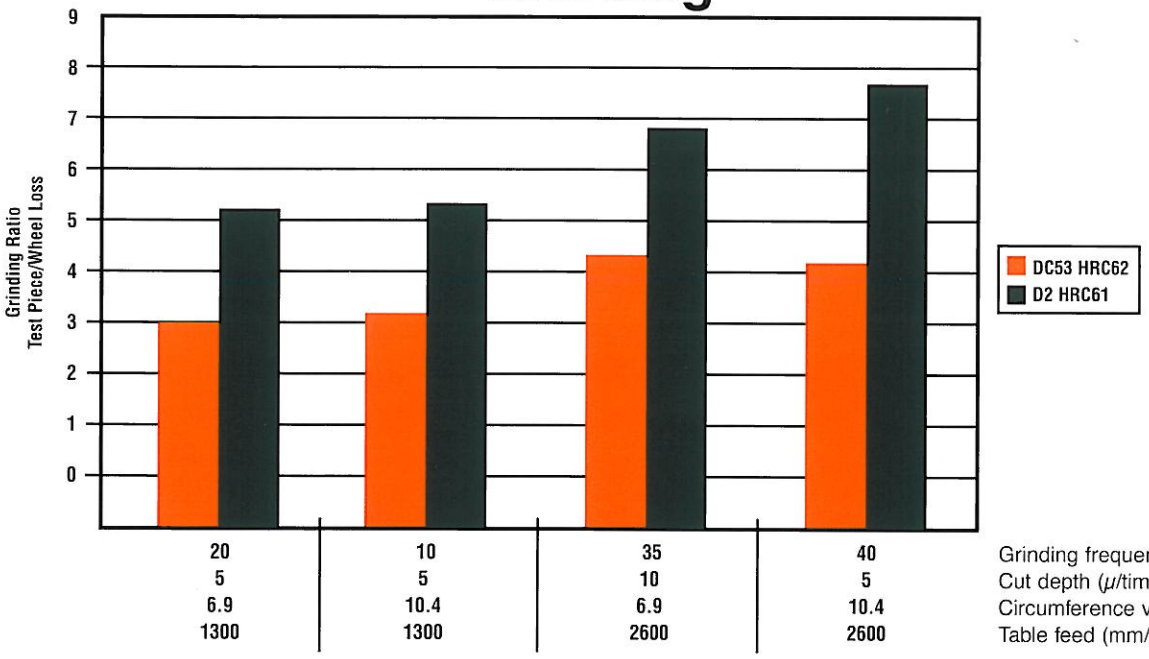
Negative rake on mill and lathe inserts is recommended.

DC53 can typically be machined 20% to 40% faster than D2 while experiencing as much as 50% less tool wear and breakdown.

Faster feeds and speeds reduce machining cost and yielding an improved surface finish.



Grinding



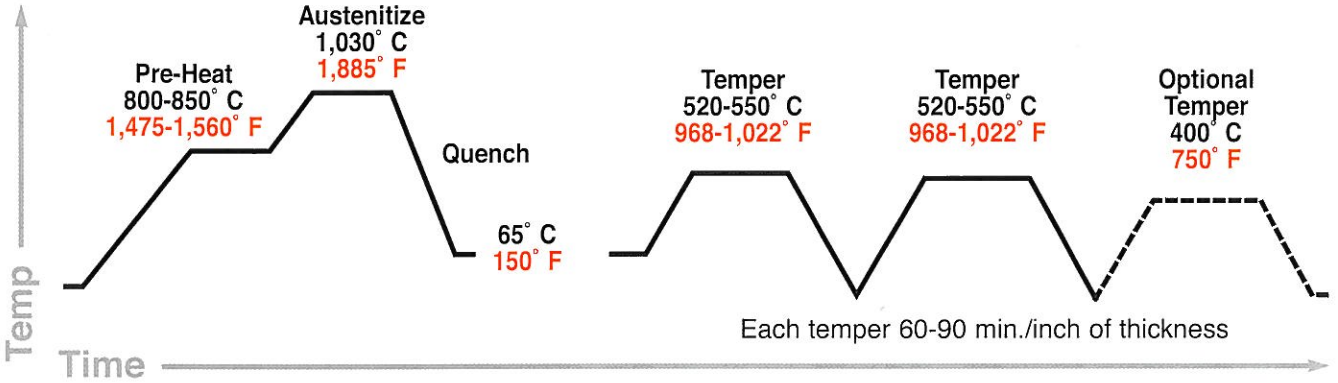
Heat Treat

Austenitize	Double High Temperature Draw	
1,030° C 1,885° F	520° C 968° F	HRC 62/64
	540° C 1,004° F	HRC 60/62
	550° C 1,022 F	HRC 58/60

Material growth .10% to .15% (.001" to .0015" per inch). An optional third temper recommended for intricate high precision components requiring EDM work or PVD coatings.

Harden

Temper



Each temper 60-90 min./inch of thickness

Vacuum Austenitize

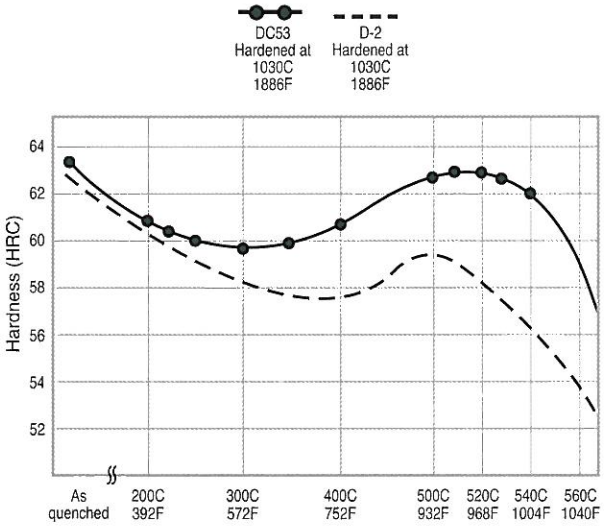
Dia./Thickness	Heating time (min)
4" (100mm) & under	20-30 min/inch of thickness
over 4"(100mm)	10-20 min/inch of thickness

2 bar quench pressure recommended.

Salt Bath Austenitize

Dia./Thickness	Immersing time (min)
1/4" (5mm)	5 - 8 min
1/2" (12mm)	8 - 10 min
3/4" (20mm)	10-15 min
1 1/2" (30mm)	15-20 min
2" (50mm)	20-25 min
4" (100mm)	30-40 min

Tempering Hardness Curve



Tempering temp.
2 tempers x 1hr per/inch thickness

Tool Applications

Application – Blanking dies for Ni based alloy materials used for medium-scale production of television components.

Results –

Working	Material Worked	Conventional Die Steel	DC53	Approximate Dimensions
Cold Pressing	Ni-based Alloy 0.2mm Thick	D2 (HRC 58/59) Tempered at 510° C	HRC 62/63 Tempered at 520° C	35mm x 100mm x 250mm
	Evaluation	**5,000 hits**	**25,000 hits**	**400% Increase**

Conclusions –

Durability: The worked material is tough and chipping and seizing of die edge were problematic.

Effect of DC53: High Temperature tempering and High Hardness are important in preventing seizing an dextending life of die edges.

Application – This type of die is commonly used; surface hardness treatment is applied depending upon the material worked and finishing preciseness required.

Results –

Working	Material Worked	Conventional Die Steel	DC53	Approximate Dimensions
Trimming	5140 HRC 23 16mm Dia.	M2 - High Speed Steel; HRC 60 CVD-Treated	HRC 62/63 Tempered at 520° C CVD-Treated	48mm Dia. x 35mm Long
	Evaluation	**11,000 hits**	**42,000 hits**	**281% Increase**

Conclusions –

Durability: Chipping of the cutting-edge and insufficient base hardness of the die led to termination of life.

Effect of DC53: In order to increase the effectiveness of surface treatment, higher base hardness of the die should be considered; the high hardness of DC53 proved effective.

Application – Blanking and forming of cold-worked bearing races.

Results –

Working	Material Worked	Conventional Die Steel	DC53	Approximate Dimensions
Cold Pressing	Cold Rolled Steel 1.2mm Thick Not Coated	D2 (HRC 58/60) Tempered at 510° C	HRC 62/63 Tempered at 520° C	80mm Dia. x 100mm Long
	Evaluation	**220,000 hits**	**380,000 hits**	**72% Increase**

Conclusions –

Durability: Wear (Galling) of inner die surface and edge chipping affected durability.

Effect of DC53: High Hardness and High Toughness of DC53 when tempered at High Temperature greatly improved durability.

Application – FB punches hook-shaped electric appliance components; its long, thin shape provides severe conditions.

Results –

Working	Material Worked	Conventional Die Steel	DC53	Approximate Dimensions
Fine Blanking	HR 1045 HRB 80 1.5mm Thick	D2 (HRC 56) Tempered at 530° C	HRC 60 Tempered at 550° C	70mm Dia. x 110mm Long
	Evaluation	**1,600 hits**	**3,900 hits**	**143% Increase**

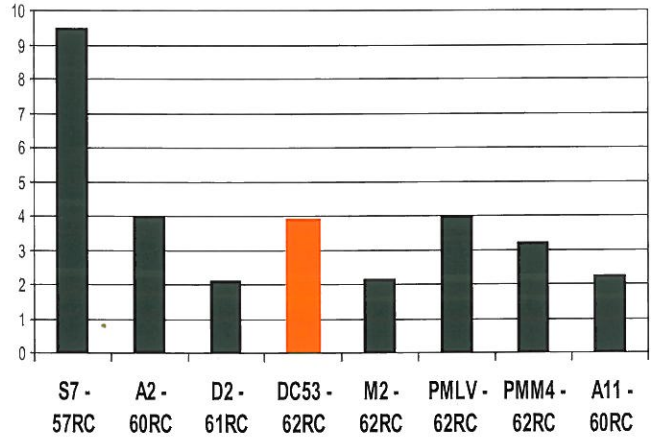
Conclusions –

Durability: Cracking and fracturing occurred at the tip of the long, thin shape, resulting in shortened life.

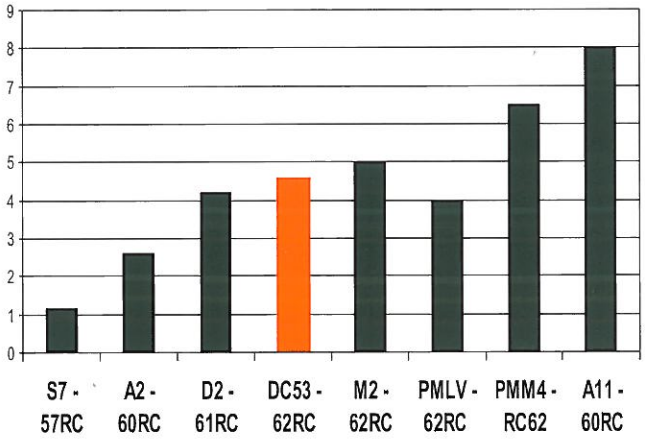
Effect of DC53: Because of DC53's excellent toughness, hardness could be increased, resulting in more than double the life.

Tool Steel Characteristics

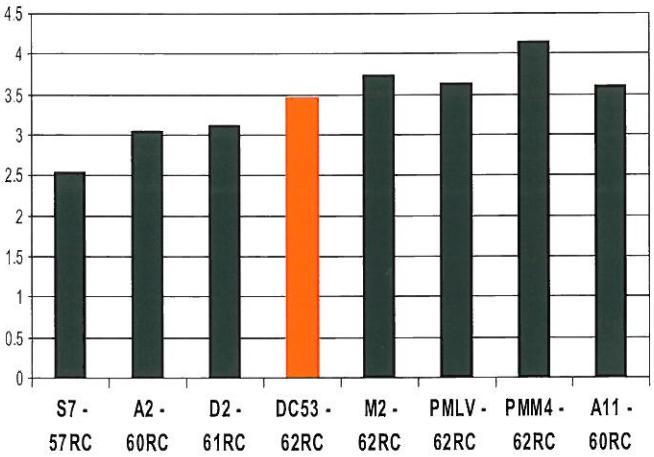
Toughness



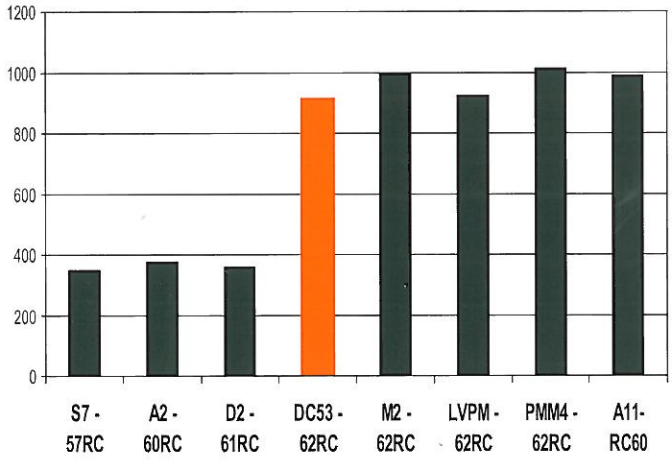
Wear Resistance



Compressive Strength



Temper Resistance



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