AWD Associates, Inc.

Hi-Performance Drill Reconditioning Specialists

Reconditioning Facts and Benefits

It is our goal to provide measurable cost improvements in manufacturing processes through:

- **Proprietary drill point geometry & treatments**
- **Revolutionary "microstructure enhancement™ process"**

Tooling problems

- Primary factors for tool life limitations
  - Heat
  - Wear
  - Vibration

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Defeating Heat

- Coatings
  - TIALN (heat & wear)
  - Hardlube (hss tools, dry machining)
  - TICN (abrasive, sticky, heat & pressure)
  - Custom coating blends (for multiple benefits)
  - Regrinds without coating
    - Lose 25% to 50% of life potential
- Tool material
  - Carbide
- Coolant
  - Thru the tool

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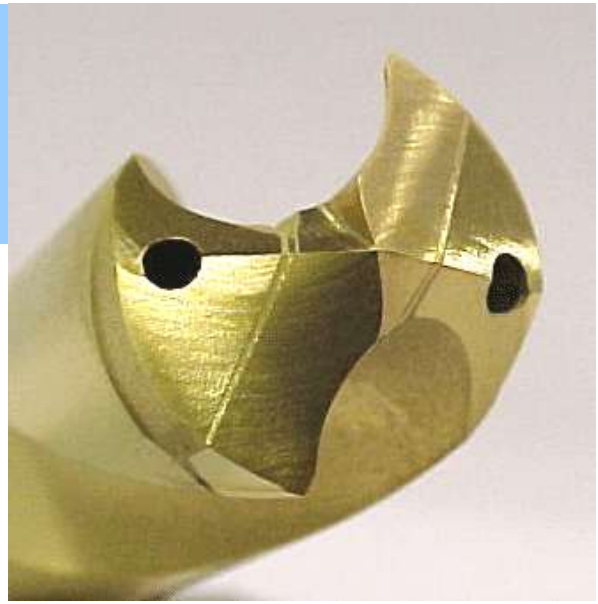
Defeating Wear



- Coatings
  - TIN (general purpose)
  - TIALN (heat & wear)
  - ALTIN (interrupted cuts)
  - Coating blends (maximize specific applications)
    - Copper, fiberglass, polycarbonates, circuit boards
- Tool materials
  - High Speed Steel tools (limited life and output)
  - Carbide (optimum life and wear)
- Drill edge prep (cutting tip)
  - Could lose 30% - 50% potential life
  - Poor edge causes tool chipping

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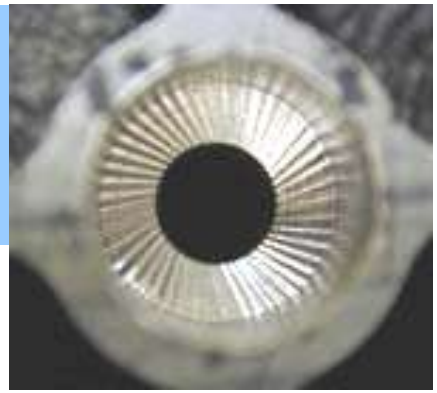
Defeating vibration



Tool chatter in the hole
High frequency vibration

- Equipment
  - Modern machines, holding devices
  - Proper alignments, bearings
  - Horsepower
- Tool material
  - All are susceptible to vibration
- Drill edge prep
  - Inconsistency introduces vibration

Wondering hole
Low frequency vibration

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Carbide or HSS ?

Factors for choosing HSS.

- Lower initial purchase cost
  - Production economics unimportant
- Machinery Limitations
  - Vibration, flex, horsepower
- Deep, small diameter drilling
  - Vibration, flex

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Carbide or HSS ?

Factors for choosing Carbide.

Increased performance

10 to 1 life over HSS

Reduced cycle time

Modern Equipment

Higher horsepower available

Improve process performance (speeds & feeds)

Stronger, more rigid drill

Better position and size control

Lower overall production costs

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Carbide or HSS ?

- Push carbide to break up chips

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Product evolution

- Demands over last 10 years
  - Closer tolerances
  - Increase horsepower & speed requirements
  - Application specific materials
  - Higher output demands
- Smaller margins & budgets

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Drill technology

- Same basic design as 50 years ago
- Evolutions
  - Point geometry
  - Drill materials
  - Coatings
  - Coolant holes more prevalent

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Tool Grinders

- Designed to manufacture cutting tools
  - Resharpenings used to help justify purchase
    - Economics don’t fit
      - Operator burden rate
      - Cost of programming, multiple wheels
    - Edge prep completed by hand
- Hi-Performance Twist drills
  - Resharpening more complex than new tool

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AWD drill processing & treatments

- Proprietary drill point geometry (new or used)
  - Increase tool life and machine performance
  - Dramatic cycle time reductions
  - Increased quality
  - Reduced chipping and fractures (less down time)
- High performance coatings
  - Matched to your application
  - Application specific coating blends
- Microstructure Enhancement™
  - Proprietary process improves the structure of the tool
  - Dramatic improvements in tool material strength
  - Substantially decreases harmonics of vibration

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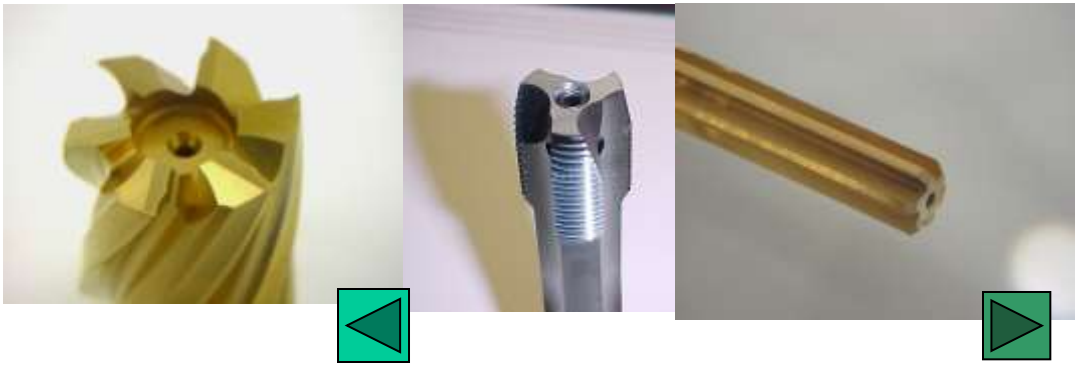
Other tooling

- Apply high performance coatings
- Microstructure Enhancement™

Results show dramatic improvements in overall life, performance and economics for a wide variety of tools.

Endmills, Taps, Reamers, Punches, Boring Bars, Gear Cutters, etc.



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Some stats to consider

- Cutting tool industry in the U.S.

  Fiscal 2004, $1.697 billion purchased US

  Globally 68% to 72% of all metal removal is drilling

  - $1,188 billion for drills (70%)
  - $509 million for everything else
    - Endmills, inserts, reamers, taps, gear cutters, etc.

  – Average $100/drill

  - 8.5 million drills per month
  - 102 million drills per year

Sources: Cutting tool digest
Manufacturing Engineering

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Statistics on drilling

- Less than 50% of drills are used twice
  - $594 million thrown away
  - Average resharpen-recoat is $25
  - Average resharpen-recoat is 5 times/drill
    - Resharpen only – 50% of new life
    - Resharpen-recoat – 70% of new life
    - AWD has consistently provided 100% or more of new drill performance

Sources: Kennametal
Sumitomo

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Cost/yield example

- New ½” drill gets 1000 parts ($100)
- No regrinds cost per hole $.10
- Typical regrind process
  - Lifetime yields
    - 4500 total parts
      - Regrind/coat 5 times ($25 each = $125 total)
      - 70% utilization on regrinds
      - 3500 parts on 5 regrinds
    - Tooling cost is $225
    - Tooling cost per part is $.05

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Improved life example

- Buy the same ½” drill ($100)
- AWD 100% performance (1000) (regrind)
- Lifetime yields
  - 11000 total holes from 1 drill
  - Recondition/recoat 10 times or more ($25 ea.)
  - That’s 1000 holes for $100, next 1000 holes @ $25 per 1000
- Total drill cost is $350
- Drill cost per hole is $.032
- Net: almost 21/2 times the holes @ 36% less cost per hole
- Cycle time and capacity improvements = bonus $

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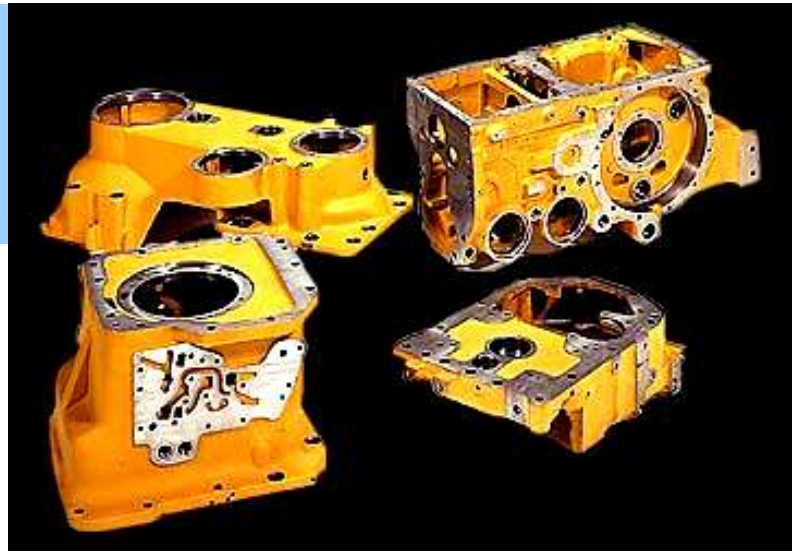
Economies of scale

- Cost of tooling on 250,000 parts
  - $.05 per part = $12,500
  - $.032 per part = $ 8,000
- Cost of tooling on 2,000,000 parts
  - $.05 per part = $100,000
  - $.032 per part = $64,000

Customer example



0.787in Dia Carbide drill - $339.00
Production of 14,600 parts per year, Material – Ductile Iron

	Current	AWD
Speed/Feed	1102 rpm/13 ipm	1456 rpm/ 20 ipm
Cut time/part	12 secs	8 secs
Avg parts/tool	73	973
Tools needed	19	2
Regrinds	181	13
Cost per part	$1.24	$0.15
Tooling Cost/year	$18,104	$2,190

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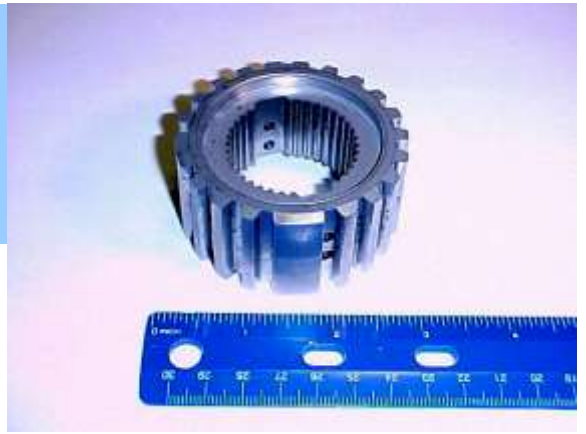
Customer example



4mm carbide drill - $ 8.60
Production of 350,000 parts per year, Material – Powdered Metal
10 regrinds per tool, Problems – burr left at end of thru hole

	Current	AWD
Parts machined - new	1000	5000
Parts machined - regrind	1000	5000
Cost for regrind	internal	$20
Tooling Cost/year	$ 592	$ 1795
Labor savings		50%

AWD Special Geometry removed burr problem.

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Customer example

0.75in HSS drill - $75.00
Production of 60,000 parts per year, Material – 1018 Steel
50 regrinds per tool

	Current	AWD
Speed/Feed	400 rpm/5.8 ipm	400 rpm/ 5.8 ipm
Parts machined - new	500	1500
Parts machined - regrind	250	1500
Cost for regrind	$15	$30
Tooling cost per part	$ 0.063	$ 0.021
Tooling Cost/year	$ 3811.50	$ 1275.30

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Thank You !

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Associates, Inc.

10560 Enterprise Dr. / Davisburg, Mi. USA 48350

248-922-9898 / Fax 248-922-1227
www.awddrills.com