

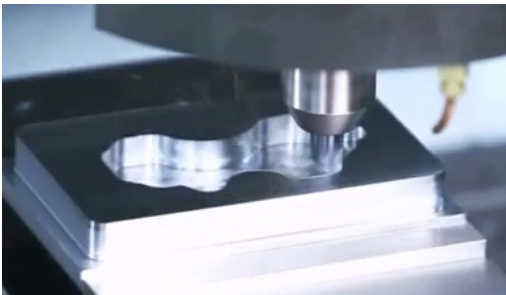
# Tool-X LLC



## Conventional Metal Working Fluids Just Don't Cut It:

Conventional metal working fluids are compromises between cooling and lubrication:

- Cutting oils offer good lubrication but don't remove heat. Cutting oils break down in the high temperatures generated by high speed cutting tools, leading to varnish, oxidation, and the loss of lubrication.
- Water-based coolants do a better job of cooling, but offer little in the way of lubrication. As emulsions break down, temperatures on the cutting edge of the tools increase, and cause microwelding and build-up on the cutting tool edges, reducing tool accuracy, surface finish, and tool life.



## Tool-X: How It Works

**Tool-X®** uses a newly developed, proprietary, extreme pressure additive made with carbon nanoparticles that works in both cutting oil and water based metal working fluids. The physical properties of the carbon nanoparticles enhance both cutting tool and metal working fluid performance:

- The nanoparticles lubricate (reduce friction) between the blade and the chips
- The nanoparticles conduct heat away from the cutting edge of the tool
- The nanoparticles remove build-up on the contact surfaces like a nanoscale polish
- The nanoparticles strain harden / shot peen the metal surfaces of the tool
- The nanoparticles, being inert, withstand high temperatures and don't break down.



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## **Tool-X is Nano Fluid Technology That Improves Machine Tool Performance:**

Tool-X is a line of cutting fluids and coolants incorporating our proprietary nanotechnology that provides tangible benefits to machine tool operators:

- Tool-X allows machines to work at faster feeds and speeds.
- Tool-X improves accuracy and precision and surface finish.
- Tool-X extends tool life and reduces overall machining costs.

**Tool-X** has been validated by many of the country's largest manufacturers and has allowed them to reduce their machining costs by as much as 25%.



## **Tool X Improves Quality:**

- Better lubrication equals more precision cuts;
- Improved surface finish and Ra
- Fewer rejects, reworks, and burr removal
- Fewer errors from tool sharpening and replacement



## **Tool X Reduces Machine Overheads:**

- Permits operation at faster cycle times;
- Higher capacity – Reduces bottlenecks
- Higher parts counts and productivity.
- Longer chemistry life
- Lower energy costs for machining and cooling
- Lower per unit costs



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## Tool-X Lowers Tool Costs:

- Shown to improve (typically double) tool life
- Less frequent tool sharpenings
- More sharpenings per tool
- Avoid using expensive coated tools
- No need for TiN coatings for many applications.
- Reduced tooling inventory
- Reduced spindle loads – fewer repairs and maintenance.
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## Tool-X Improves Many Machine Tool Operations:

Tool-X has documented its benefits in numerous case studies:

### Swiss Screw and Davenport machines

- faster cycle times and improved tool life ([#101](#))

### CNC machines

- faster speeds and longer tool life for horizontal milling ([#102](#))
- improved Ra and longer tool life for milling ([#103](#))
- improved tool life for a CNC turning center ([#104](#))
- improved accuracy and RMS for horizontal milling ([#105](#))
- improved surface finish in CNC turning center ([#106](#))
- increased tool life machining fasteners ([#109](#))
- improved Ra machining 7075 aluminum ([#112](#))
- improved productivity machining 302 stainless steel ([#116](#))



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## Gun drilling

- improved tool life in gundrilling (#107)

## Thread rolling

- reduced tool costs rolling high strength steel (#108)

## Tapping

- reduced expenses tapping tie bars (#110)

## Grinding

- faster speeds when grinding (#111)

## Cutting

- extended saw blade life cutting steel molds (#113)

## Reaming, Boring and Honing

- improved tool life reaming cylinder heads (#114)
- improved metallurgy after CNC boring (#115)

In addition to our case studies, we have also seen improvements in other applications:

- **Broaching**
- **Cold heading** – shavers
- **Forging fluids** (under test)
- **Stamping fluids** (under test)

