

# ENGINE PRO

Engine Parts At Any Speed



## ENGINE PRO TECHNICAL BULLETIN

[www.enginepro.com](http://www.enginepro.com)

### Engine Pro Nitro Black Race/Performance Valves



#### ENGINE PRO NITRO BLACK RACE/ PERFORMANCE VALVES

Valves used in a racing environment must withstand extreme stresses. They include:

- Operating when valve head temperatures are 750 degrees centigrade or more.
- Surviving continuous high speed motion within the valve guide.
- Threat of abrasion and compressive breakage at the end of the stem.
- Resisting corrosion caused by exotic fuels.

In the past, the solution has been to make race valves from expensive exotic materials such as Inconel.

Engine Pro has arrived at a different and more affordable solution - Nitro Black Valves..

#### HOW NITRO BLACK VALVES ARE MADE

To begin with, Nitro Black valves are manufactured from high quality 21-4N stainless steel material which is upset forged into a one piece valve. It is then machined with an undercut stem, a hard wafer tip is welded on and the head is swirl polished. At this point,

a conventional 21-4N performance valve such as our Engine Pro 2000 series or a Ferrea 6000 series would have the stem hard chrome plated and be ready to use. Not the case with the Engine Pro Nitro Black Valve.

Nitro Black Valves are now put through a proprietary five step liquid nitriding process using special salts.

#### EXPLANATION OF THE NITRO BLACK LIQUID NITRIDING PROCESS

- Valves are heated to 350 degrees centigrade in a re-circulating air pre-heat furnace.
- Next, they are immersed in a molten nitrogen rich solution in an aereated furnace at a temperature of 580 degrees centigrade. This is the oxidizing process.
- Now the valves go to a cooling bath which is 400 degrees centigrade. This step creates a black iron oxide layer called Magnetite on the surface of the entire valve. The Magnetite layer greatly increases corrosion resistance and also ensures the dimensional stability of the valve. Valves are now cooled to room temperature and cleaned.
- Valves are now polished.
- The final step is "post oxidizing". Valves are again placed into a molten nitrogen solution and heated to 400 degrees centigrade, resulting in a shiny black surface which is both smooth and hard. Another advantage of post oxidizing is that corrosion resistance is further increased.
- The five steps take several hours to complete. Nitro Black valves are now placed in protective plastic webbing and packaged.

#### Scanning Electron Microscope Comparison



Surface Texture Tests (Roughness measurement)

Nitro Black Rp: .....38.5 micro inches

Chrome Rp: .....48.8 micro inches

#### BLACK VALVES VERSUS CONVENTIONAL 21-4N VALVES

- Valve stem is 21% smoother than a chrome plated stem. This has been proven in scanning electron microscope examination.
- Smoother valve stem means less valve and valve guide friction, resulting in less wear and more power.
- Stronger and more corrosion resistant than a chrome plated valve.
- More ductile throughout the entire valve material than a valve that is not five step liquid nitrided. Proven in Rotating-Bending Fatigue Tests.
- Valve is less likely to break even if contacted by the piston.
- Improved corrosion resistance when used with exotic fuels, including nitrous.
- Our nitriding process is much cleaner than chroming. It's better for the environment.
- Much lower cost than valves made from exotic alloys.