

## **NanoBlox, Incorporated**

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# **EMERGING USA NANODIAMOND APPLICATIONS**

S. Charles (Chuck) Picardi – CTO

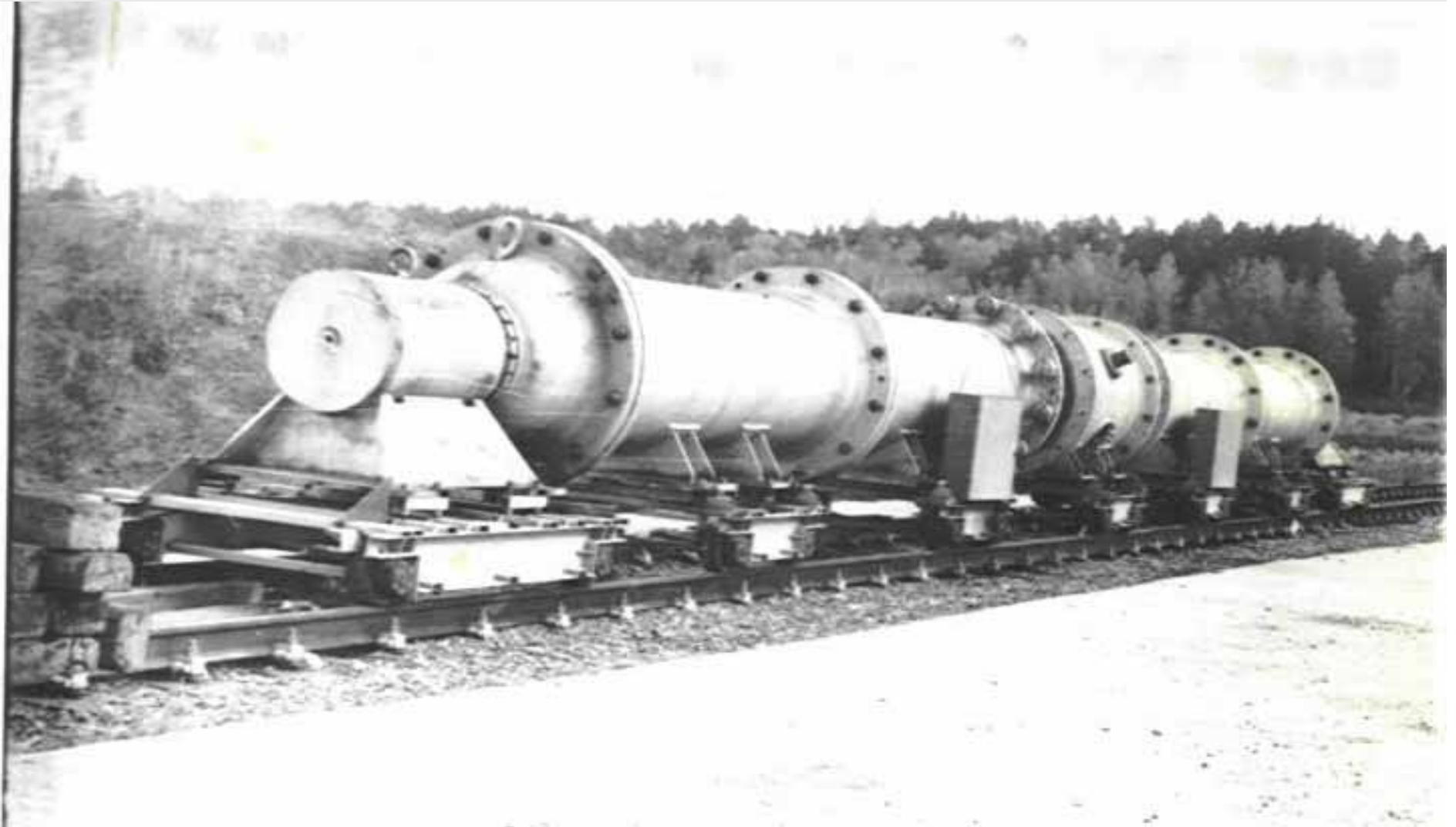
## **Nano For Business Conference-2008**

# NEW TO THE USA

	<b>Year</b>	<b>Authors</b>	<b>Organization</b>
<b>1<sup>st</sup></b>	<b>1963</b>	<b>K.V. Volkov, V.V. Danilenko, V.I. Yelin</b>	<b>RFNC - VNIITF, Snezhinsk, Russia *</b>
<b>2<sup>nd</sup></b>	<b>1982</b>	<b>Yu. I. Savvakin</b>	<b>IPM, Ukraine Acad. of Sci., Kiev</b>
<b>3<sup>rd</sup></b>	<b>1982</b>	<b>A. M. Staver, A. I. Ljamkin, E. A. Petrov</b>	<b>IG, Russian Acad. of Sci., Novosibirsk</b>
<b>4<sup>th</sup></b>	<b>1988</b>	<b>N. R. Greiner, P. S. Philips, J. D. Johnson, F. Volk</b>	<b>Los Alamos Lab., USA. Fraunhofer Inst., Germ.</b>

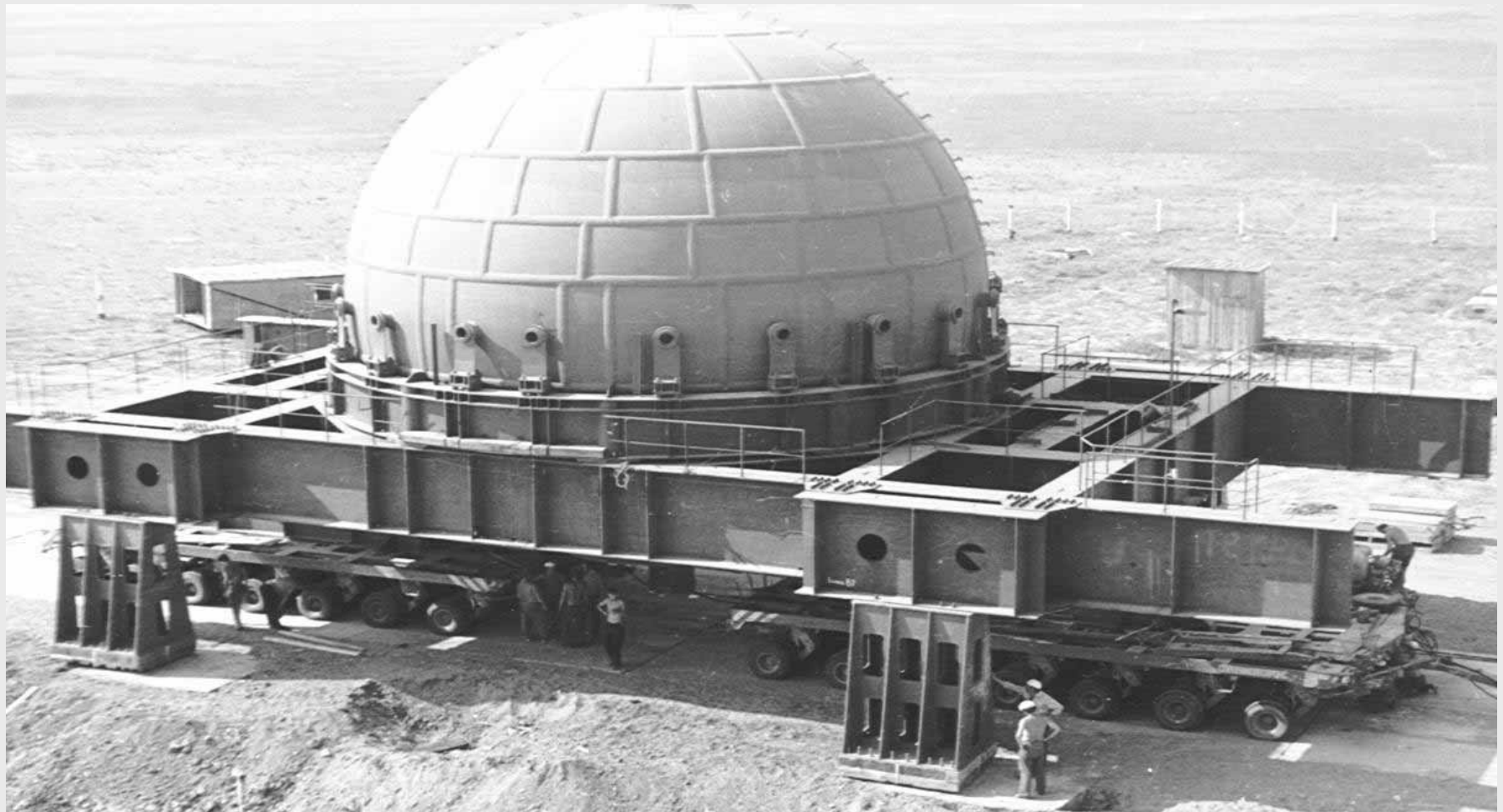
\* *V.V. Danilenko // Phys. Solid State. 2004, V. 46, N 4.*

1963-Cylindrical Reactor VNIITF  
(Snezhinsk, Siberia, Russia)  
( $d = 1.5$  m,  $L = 12$  m, charge 40 kg)

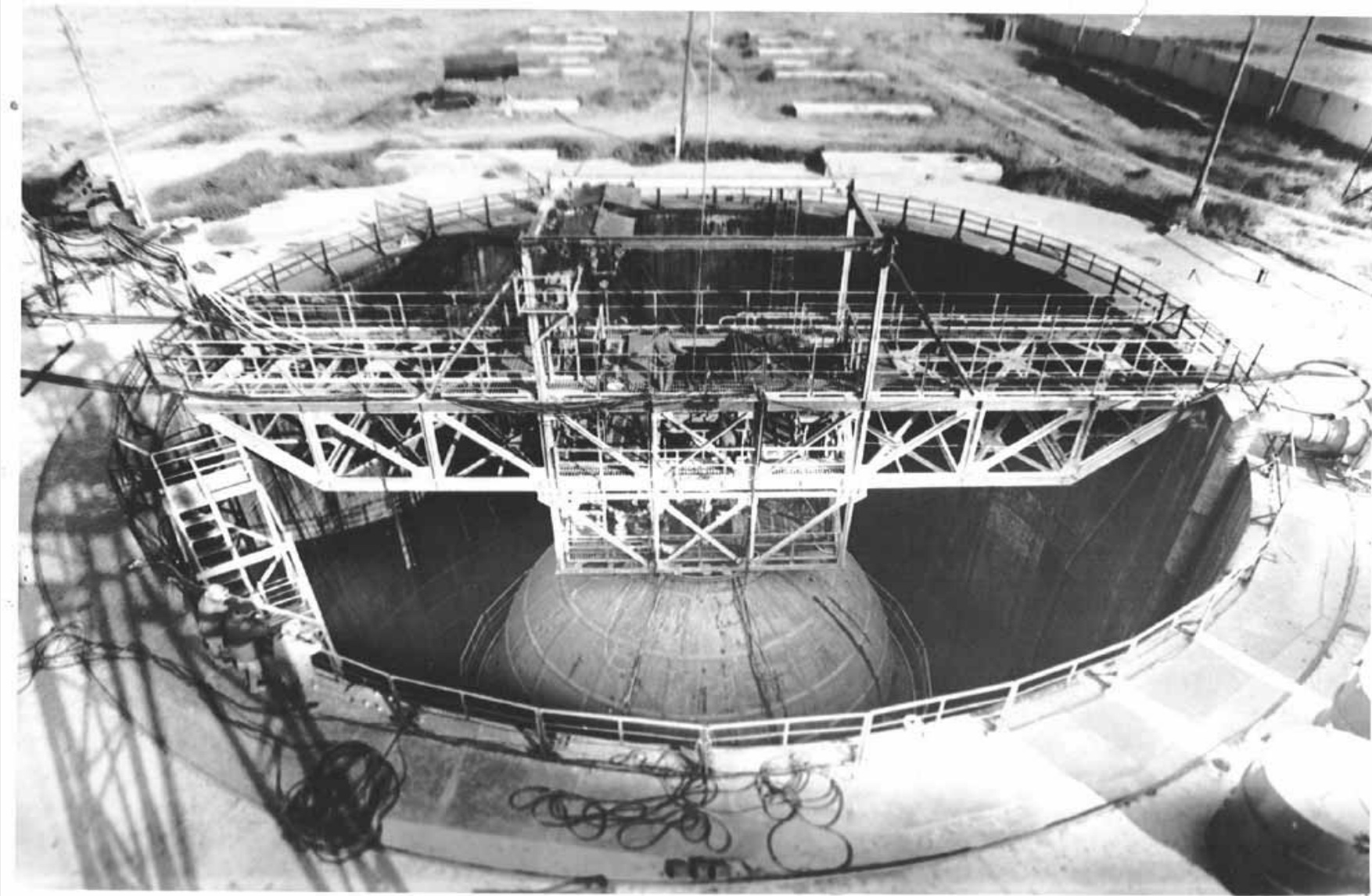


# 1964-Spherical Chamber VNIIEF (Sarov)

Maximal charge 1 ton, diameter 12 m, weight 350 tons



# 1964-Installed in Kazakhstan Nuclear Missile Silo





## **1992-100 Cu.M. Nanodiamond Reactor in Ukraine**

Diameter = 2.5 m, volume = 100 m<sup>3</sup>

Explosive weight 10 kg (Comp. B) in ice shell.

Aqueous internal mist before and  
during explosion in the reactor.

Production capacity ~ 1.5 ton / year.

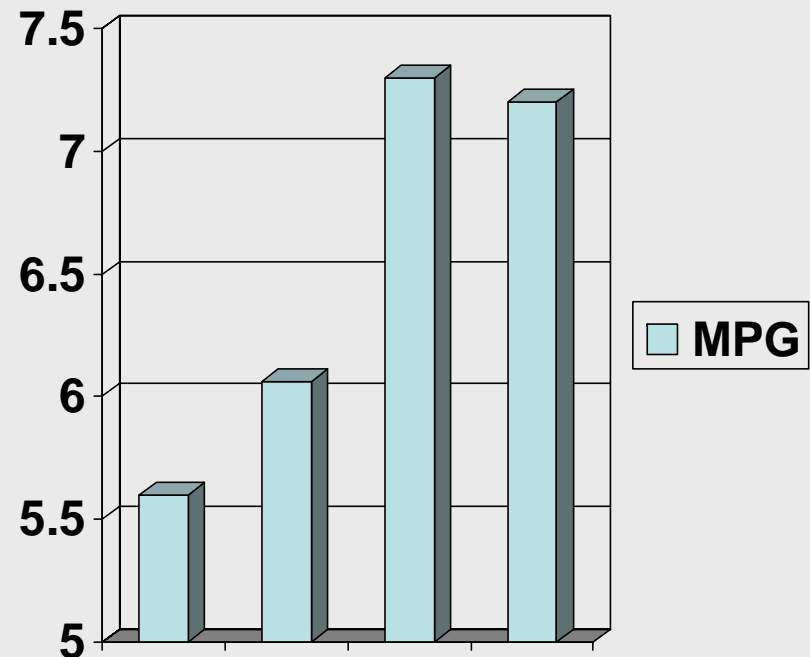
**V.V. Danilenko Patent SU 1813293 A3 (1991)**



# Lubrication-MOTOR OIL

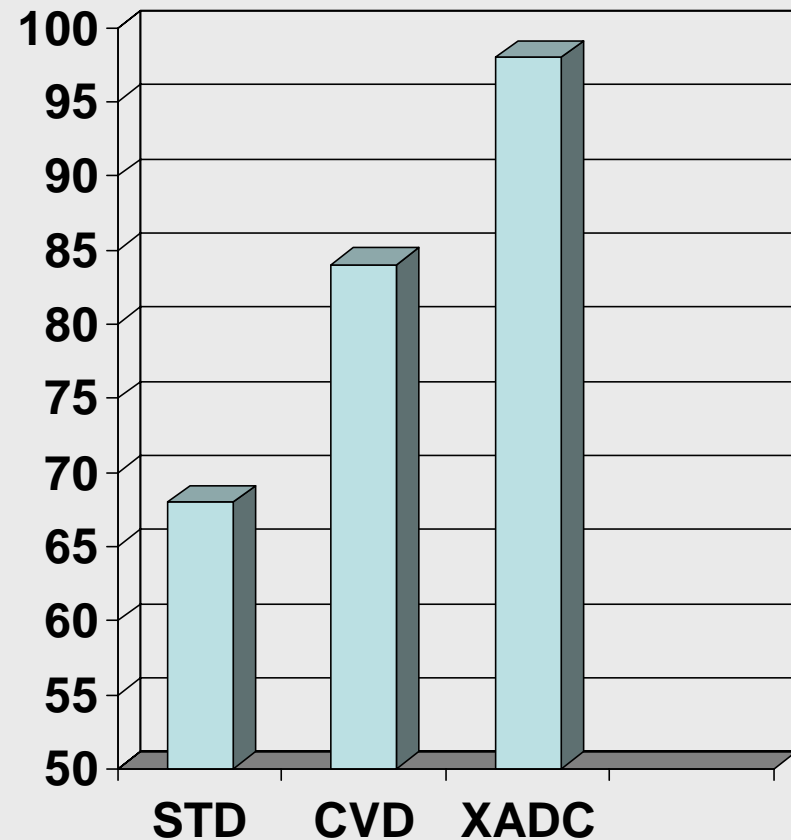
- In 1964, the Russian military manufactured over 10,000 kg of nanodiamond for motor oil to extend the operational range of its tanks, ships, and aircraft.
- In 2007, National Freight located in Allentown, PA became the first commercial trucking company in the USA to test NanoBlox 15W-40 Diesel Motor Oil. To date, they have realized an 8% increase in fuel economy.
- Potential fuel cost reduction of 7-8 million dollars per year for their national fleet.

## NFI Fuel Economy



# Metal Plating-COATING

- In 1965, Russia began the chrome plating of military components (gun barrels, cannons, etc.) with nanodiamond enhanced plating solution.
- In 2004, Armoloy Corporation began using NanoBlox nanodiamond in its chrome plating baths, increasing the hardness of chrome plating from 68 Rc to 98 Rc. This product is called XADC Chrome.
- In 2007, the US military began its testing and qualification of NanoBlox nanodiamond at ARDEC, Picatinny Arsenal, NJ; and, at ARL in Aberdeen Proving Grounds, MD.

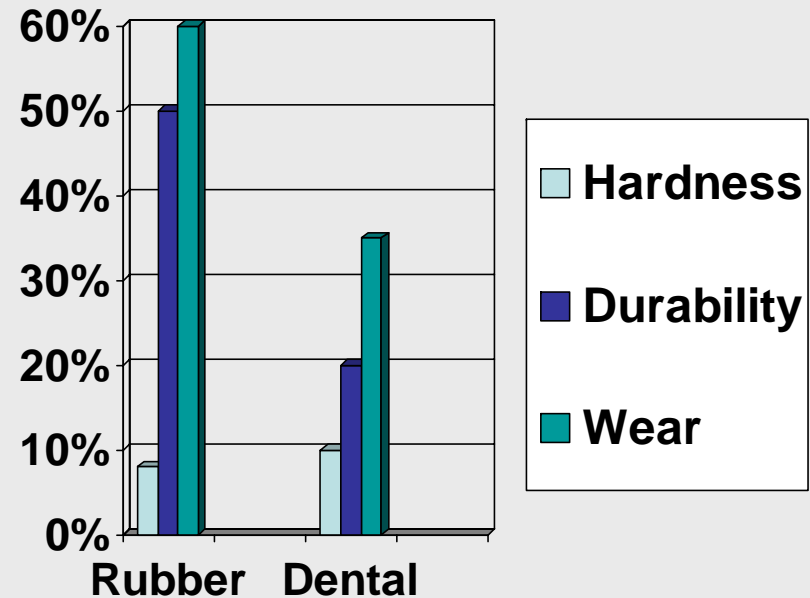




# Polymer-COMPOSITES

- In 1970, nano-diamond was added into Russian military aircraft tires as a replacement for carbon black resulting in improved wear and durability.
- September 13, 2006, Nissan Motor Company files for a Japanese Patent incorporating nanodiamond in tires.
- November 13, 2007, US patent 7,294,340 issues using nanodiamond in dental and cosmetic composites.
- March 8, 2007, Nissan Motor Company files for a US patent that incorporates nanodiamond into tires.

**% Increase in Properties**



# Bio-Pharma-MEDICINE

- In 2004, Alexy Puczyr discovers medicinal and diagnostic applications for nanodiamond materials in Vovosibirsk, Siberia, Russia. This announcement was made at a Nanodiamond Conference held in Belokhurika, Siberia, Russia
- September 27, 2007, a US patent application for the use of nanodiamond in diagnostic and pharmaceutical uses is filed based on a PCT filing from May4, 3005 (Max Planck Institute).
- Nanomedicine is an emerging area of biomedical research that has potential for advancing medical science. This area of research entails the creation and use of materials at the level of molecules and atoms in order to investigate and treat diseases and disorders; generally less than 100 nM in size. The unique properties of nanomaterials, including nanodiamond and quantum dots make them potential candidates for rational delivery and targeting of pharmaceutical, therapeutic, and agents for disease diagnosis, treatment, and prevention of a wide range of disease processes. Many of these molecules can be easily manipulated and functionalized by the addition of drugs or solubilizing groups within their structure or to their external walls. This allows for specific homing to precise targets (cells, receptors, etc) related to clinical conditions to achieve the required response while minimizing side effects given their sub-cellular size.