

# *Copper Fouling and its Effects*

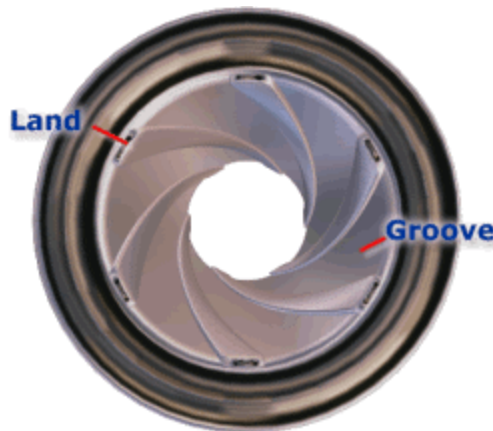
**Why is Copper Fouling something you need to pay attention to?**



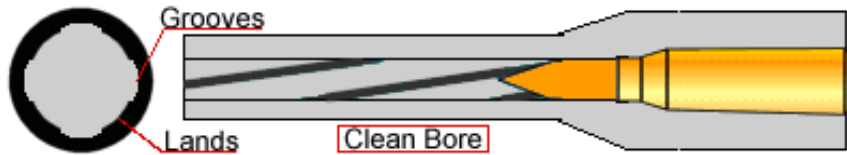
Richard Kean 2010

# What is Copper Fouling?

- Copper Fouling is caused by copper jacket bullet material being left in the barrel after each firing
- Copper is soft and malleable and eventually lines your barrel
  - (copper fouling tends to accumulate on the rifling first)*
- Copper fouling is accumulative and builds with every shot fired whereas Powder residue will accumulate to a certain point and then stabilize.
- Copper fouling turns green once oxidation takes place



# Copper Fouling is Cumulative?



The rate of copper fouling has a lot to do with bore condition

Clean and well maintained barrels foul less than dirty bores

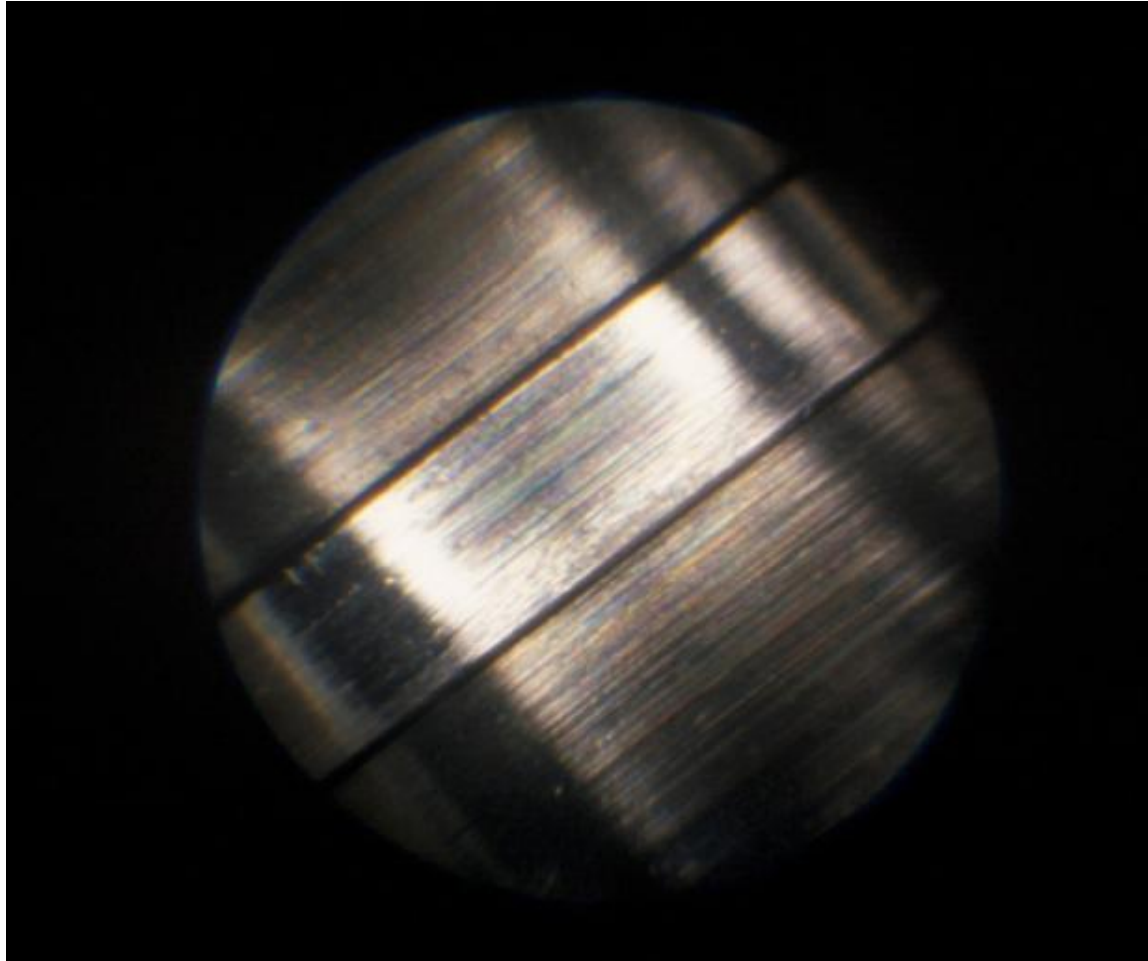


Barrels free from corrosion and pitting foul less

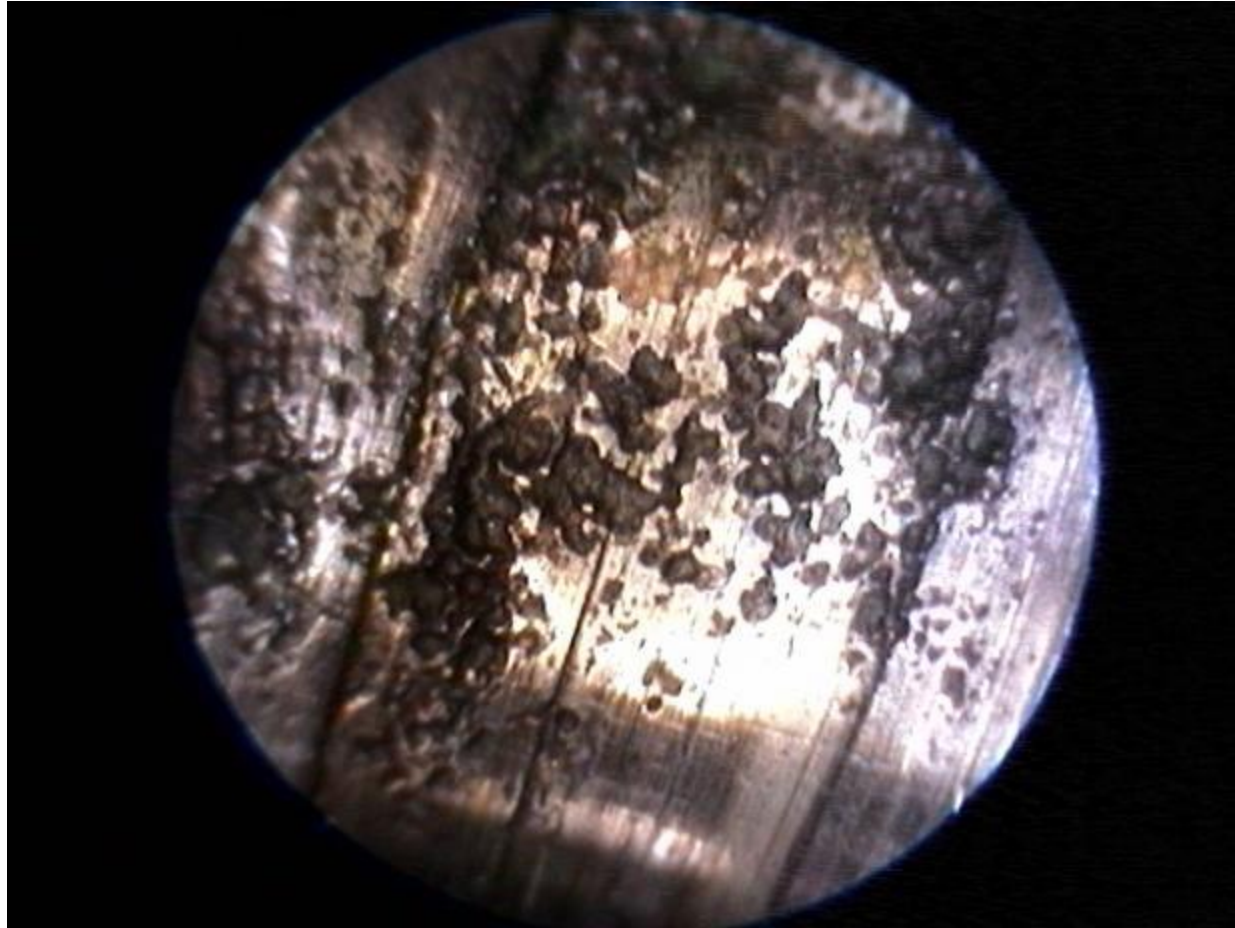


Smooth bores accumulate less copper than rough bores

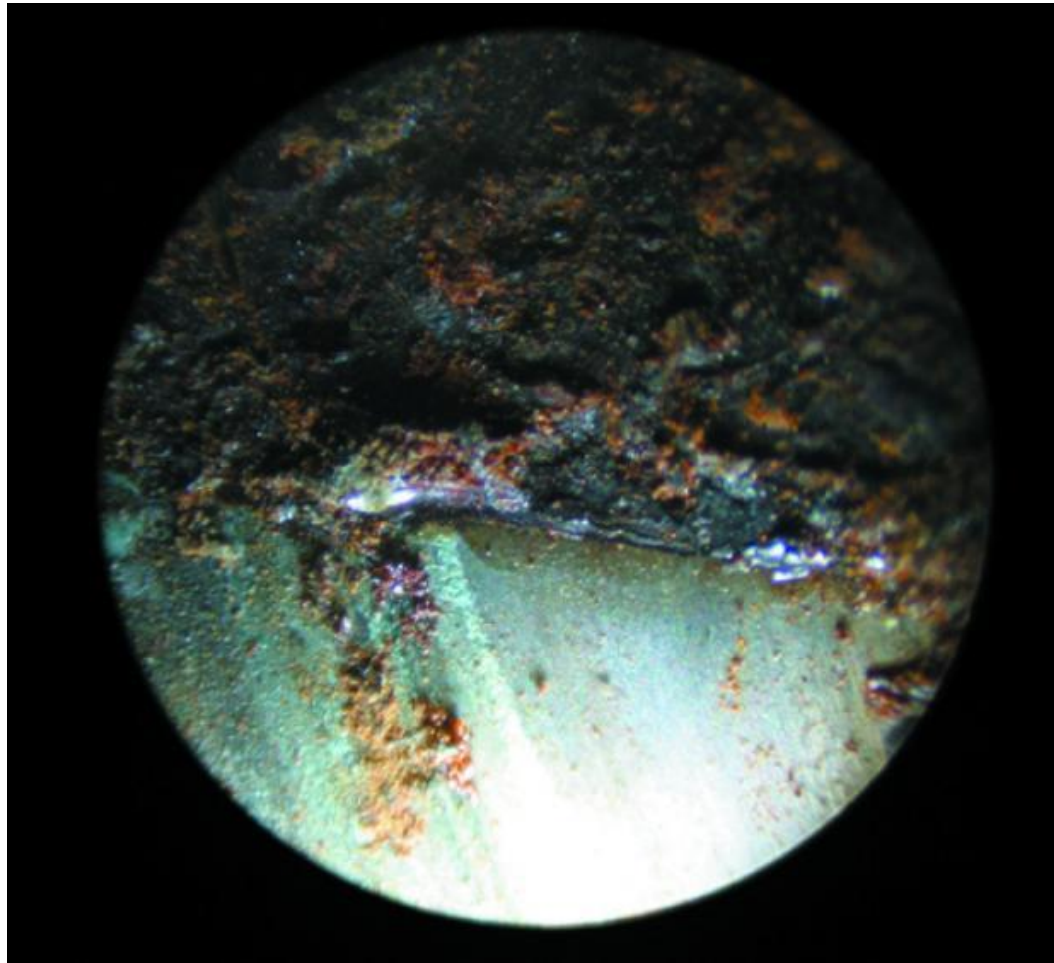
# Rate of Copper Fouling



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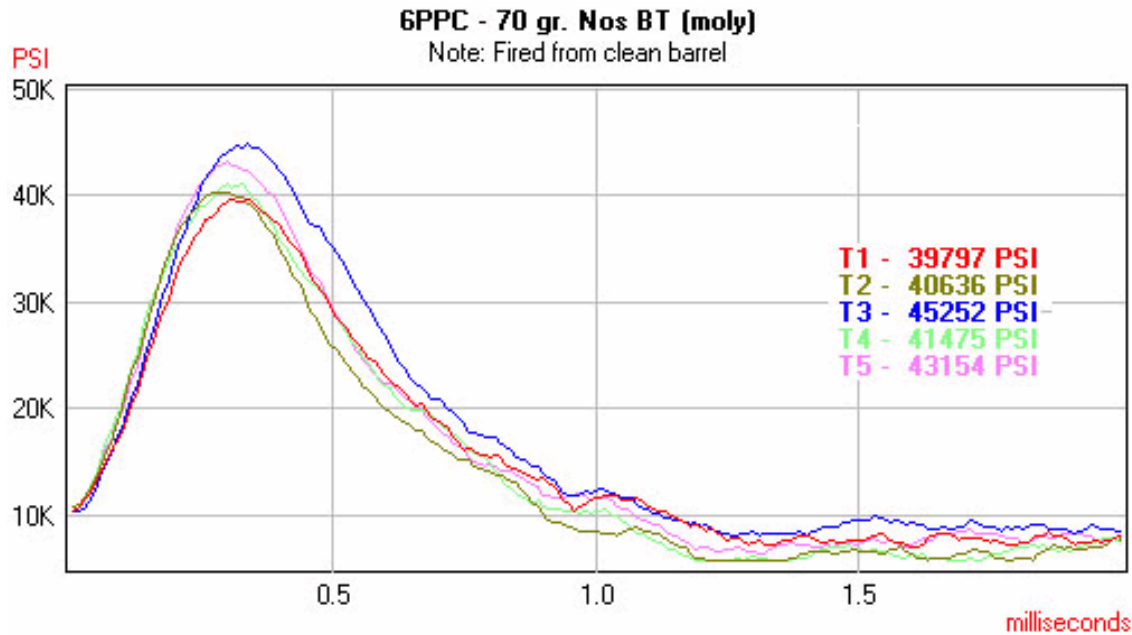
# Effects of Copper Fouling

What's the big deal Richard? Who Cares?





# Internal & Exterior Ballistics

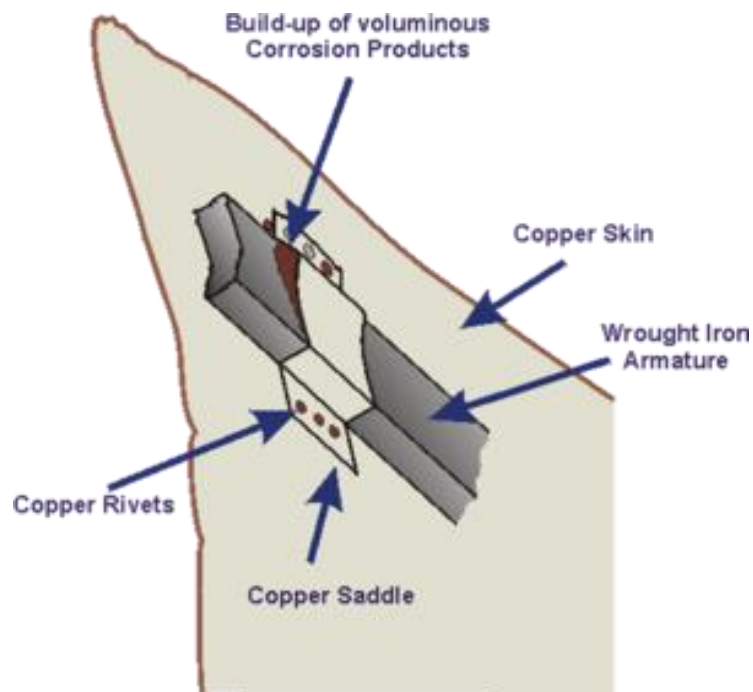


1. Chamber Pressure increases as the bore fouls
2. As chamber pressure increases POI will rise (example: water fouled bores)
3. Barrels sufficiently obstructed by copper and corrosion can cause severe pressure spikes and potentially pose a safety hazard (No4 pressure limit is 40,000 psi)
4. Badly fouled bores incur drag on the bullet and negatively impacts velocity
5. As grooves are filled with copper there is less purchase for the rifling to grasp the bullet and rate of twist is impacted (1:10 twist).
6. Reduced twist results in bullet de-stabilization upon breaching the sound barrier (bullet goes subsonic) resulting in cavitation and tumbling at long ranges

# Other Impacts - Galvanic Corrosion



Copper should not be in direct mechanical contact with metals of different electro-potential (for example, a copper pipe joined to an iron pipe), especially in the presence of moisture, as the completion of an electrical circuit



# Electrolysis – Galvanic Corrosion



**1978 Land Rover Series III 88“**

Body Mounts, Firewalls and Bulkheads are an issue with old Land Rovers because of Electrolysis between the steel frame and the aluminum body panels. The same process happens in a copper lined rifle barrel.



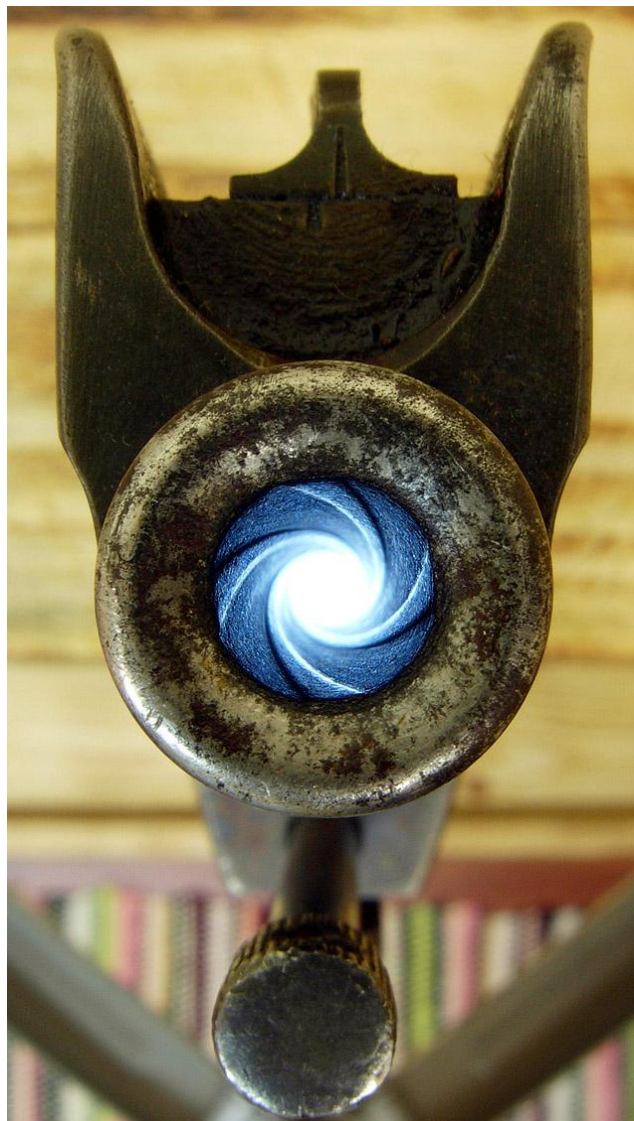
# M91/30 Mosin Nagant

Condition: Poor, Fair, Good or Excellent?



# M39 Mosin Nagant

Condition: Poor, Fair, Good or Excellent?



# M39 Mosin Nagant

Condition: Poor, Fair, Good or Excellent?



# M39 Mosin Nagant

Condition: Poor, Fair, Good or Excellent?





# How do I effectively remove copper fouling?

You need to source a solvent specifically designed to remove copper

- Hoppes 99 is a general purpose cleaner but does not adequately remove strong copper deposits
- Break Free is a good general cleaner and lubricant but it does not adequately remove copper
- Only Ammonia based solvents, Or KG-12, are proven to effectively remove copper fouling
- You need elbow grease, the appropriate solvents and cleaning tools for this to work effectively

# Recommended Copper Removing Solvents



15 Minute Rule for all Ammonia Based Solvents

# General Purpose Solvents, Lubricants and Degreasers

1. General purpose solvents are used to remove powder fouling and residue from the bore and detail various parts of the rifle.
  - WD40
  - Break Free (CLP)
  - Liquid Wrench
2. Lubricants are for the purpose of the movement of parts (eg. Bolt, sear and trigger assembly, sights, etc..) and for storage.
  - 15W40 motor oil
  - Break Free (CLP)
  - **DO NOT USE WD40 FOR STORAGE AS IT IS HYGROSCOPIC**
3. Degreasers are used to remove oil or other contaminants from the bore prior to shooting. Also used to remove oil from the gas system of semi-auto rifles prior to shooting.
  - Brake Cleaner
  - Acetone

**Hygroscopy is the ability of a substance to attract water molecules from the surrounding environment**

# Cleaning Tools

Chamber Brush



One piece cleaning rod



Patches



Brass Muzzle guide



Patch Jag



Brass Brushes

