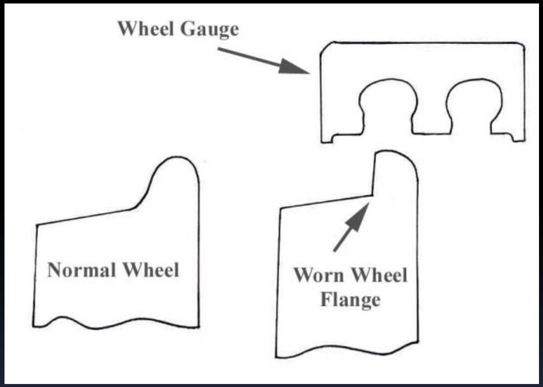
AR8300 COMPLEX NANOCERAMIC GREASE FOR RAIL & WHEEL FLANGE LUBRICATION

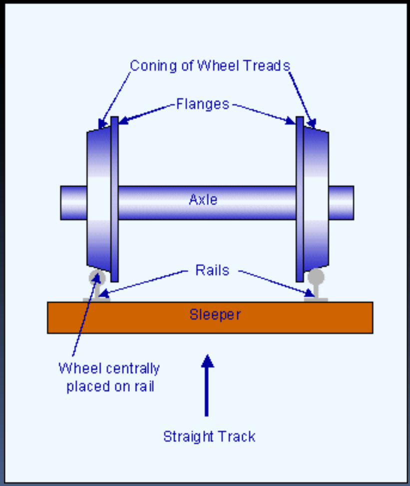
Nanolubrication technology for extreme applications and environments

RAIL & WHEEL FLANGE WEAR IN CURVES

AR8300 lubricant reduces wear on curve rail and wheel flanges to a low 0.003 coefficient of friction and a hardness 5 times harder than the metal alloy applied to.



Wear reduced 2.2 times from 0.13 to 0.06 mm/million gross tons.
Rail and wheel life doubled.



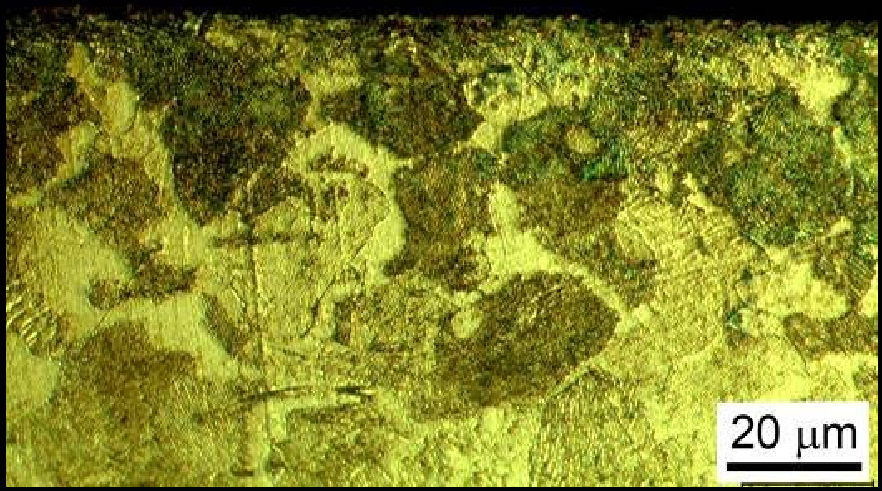
The Force Of Friction

The force of friction resulting in the intensity of wear depends upon three factors

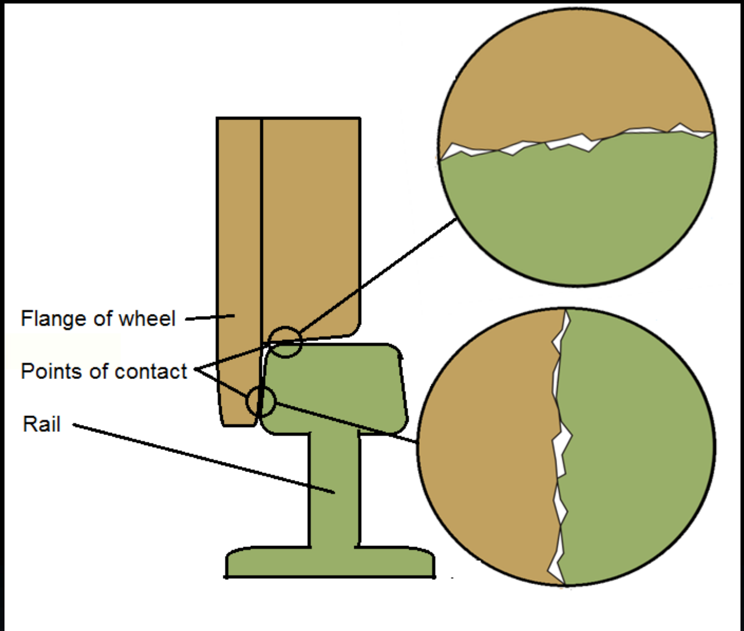
1. Roughness of the surface
2. Force of pressure
3. Hardness of the material

Entering a curve the force of friction encounters the resistance of force from the surface roughness. By practically eliminating surface roughness the force of friction is dramatically and economically reduced

Surface Roughness And Hardness



The roughness of the surface with its asperities as viewed here under an electric microscope reveals the challenge facing every lubricant to lessen or eradicate this surface challenge which results in rapid wear at a great economic expense

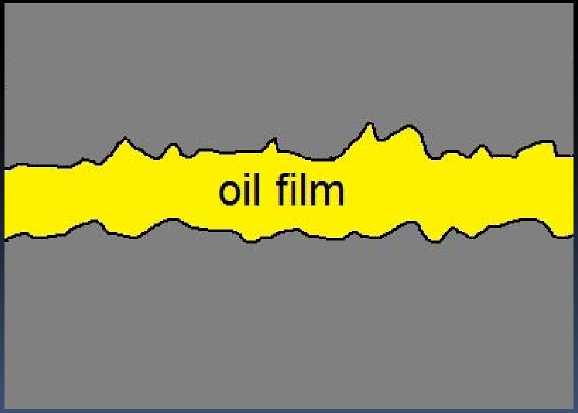


Pic.1

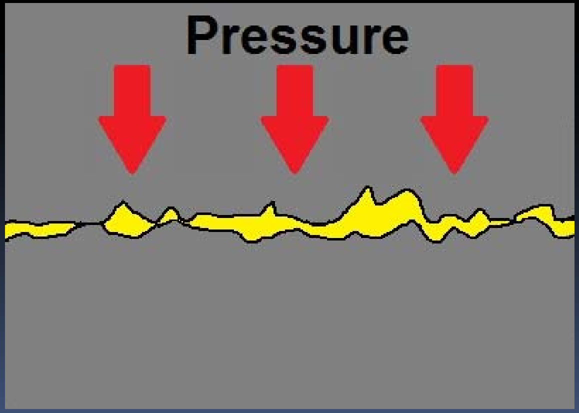
Reducing the coefficient of friction is only one feat to accomplish, without increasing the hardness of the metal we are only halfway there

Lubrication Is Not Efficient Enough

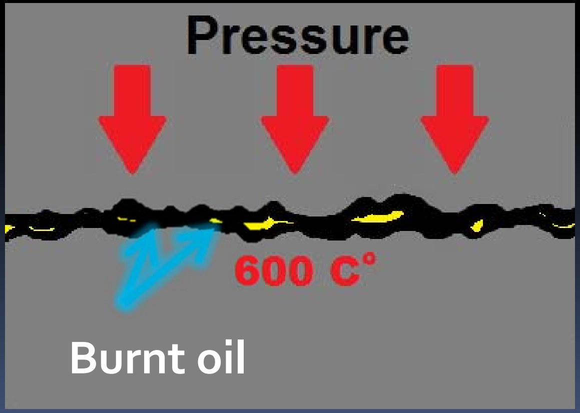
One of the purposes of a lubricant is to create a oil film barrier between two moving surfaces which carry an anti-wear additive package such as zinc, phosphorous, sulfates or may contain moly in order to protect friction contact areas. These additives work to a degree under normal operating conditions but for extreme pressure areas and high heat they fail and press out or even burn off when approaching temperatures of 600C. AR8300 will not and actually seeks out heat spots creating a new hard smooth surface with the lowest COF



Pic.1



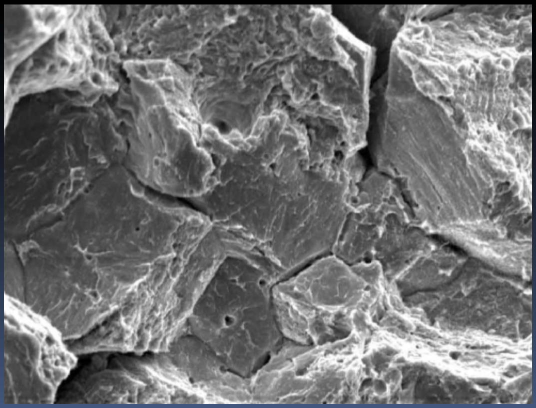
Pic.2

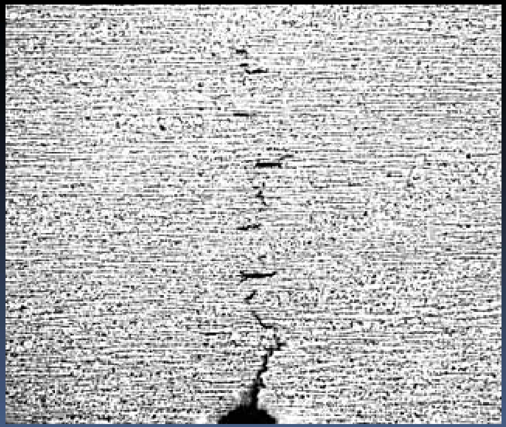


Pic.3

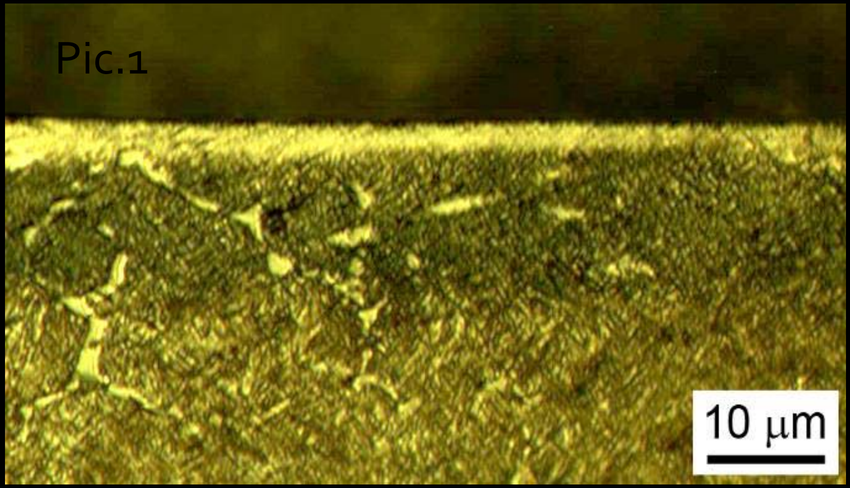
Stops Hydrogen Embrittlement

AR8300 protects against the further weakening of metal as a result of hydrogen which is often unintentionally introduced during forming or finishing operations. Also as metal fatigues it is acceptable to the absorption of hydrogen. AR8300 stops the process of hydrogen embrittlement thus maintaining the integrity of the metal. Through ionic bonding to the metal surface hydrogen is sealed out.





Visual Results On Metal Surface Of AR8300

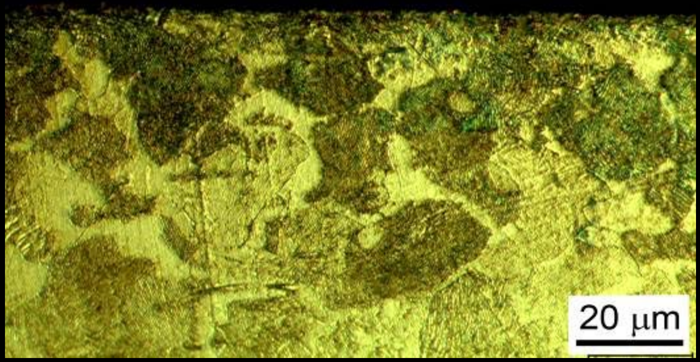


The new smooth tribo-layer can be seen in picture 2 through an electronic microscope. This new nanoceramic surface is formed by a chemical interaction between the nano-compound and host metal preventing metal to metal contact.

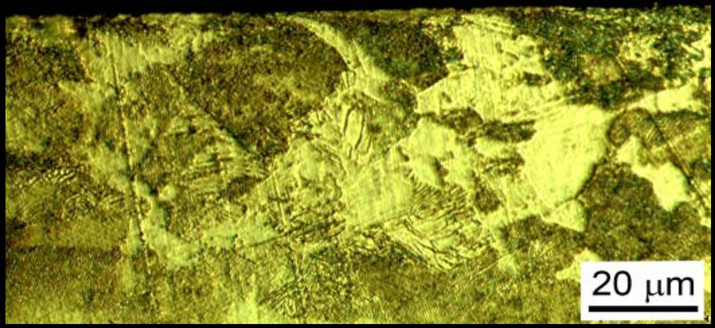
LAYER FORMED AT THE FRICTION SURFACE

Metal surface in the friction zone with no protective boundary layer (Pic.1 & 2)

Pic.1 Before

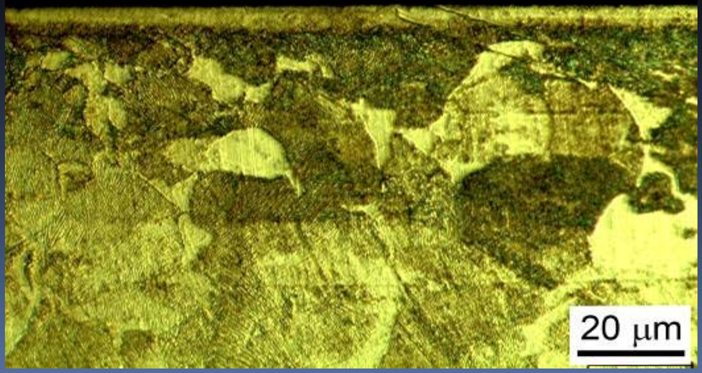


Pic. 2 Before

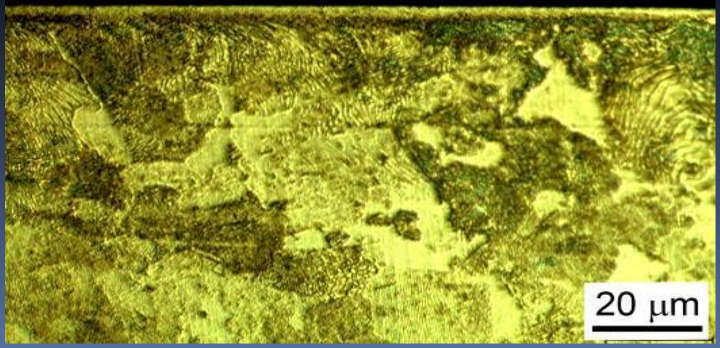


Newly formed AR8300 protective smooth surface (Pic.3 & 4)

Pic.3 After

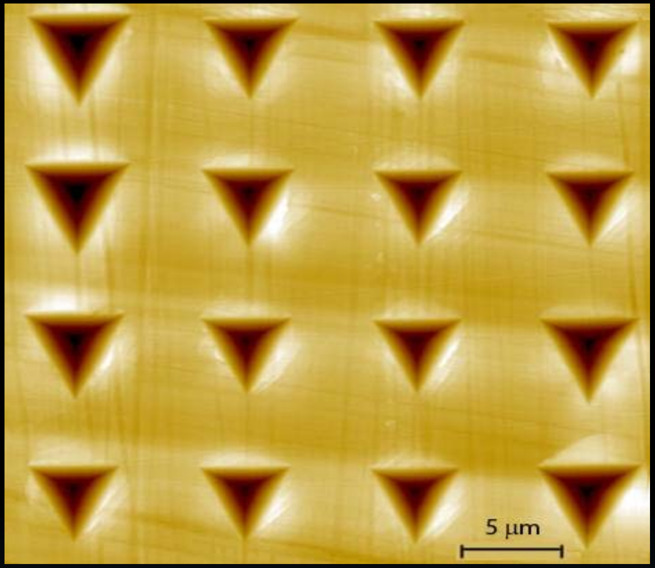


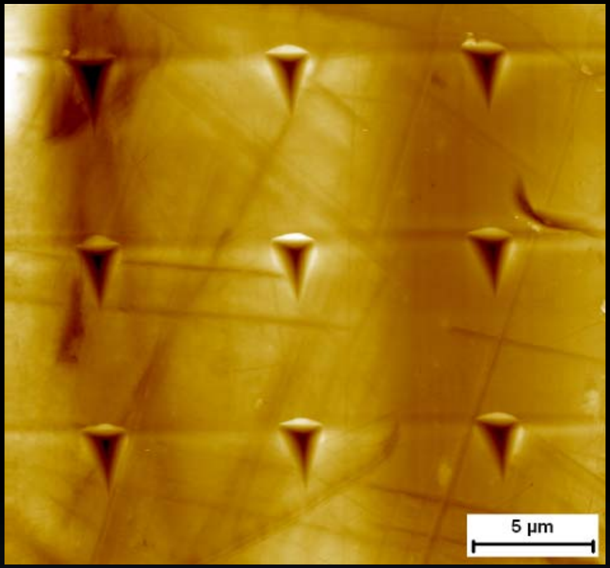
Pic.4 After

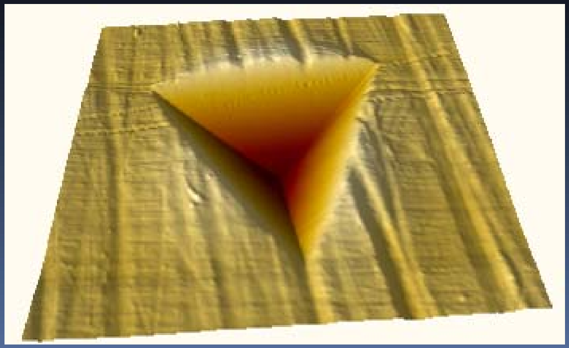


MICRO-HARDNESS

The micro-hardness mean value for the base metal is 2.5 Gpa. After the application of NANOURAL the metal is 5 X the micro-harness mean value (12.5 Gpa)







Test On Track Sections For Sverdlovsk Railroad

- Four sections of track were selected for test application to determine the efficiency of AR8300 grease. The sections are 100m long and part of a circular curve radius of R350m and length of 640m
- At the beginning of the test the track sections had an average wear of 0.05mm
- No other lubricants were introduced during this test trail

Results

- On pages 12-13 results show the reduction of wear by 2.2 times (from 0.13 to 0.06mm.million gross tons)
- Test showed that a once a month application is sufficient
- Consumption of lubricant was reduced 2.5 times (usual consumption was not less that 17kg per month per 100m of rails)

Calculating the annual savings per 100m of track compared

to lubricant in use without AR8300

- Minimum annual savings of lubricant

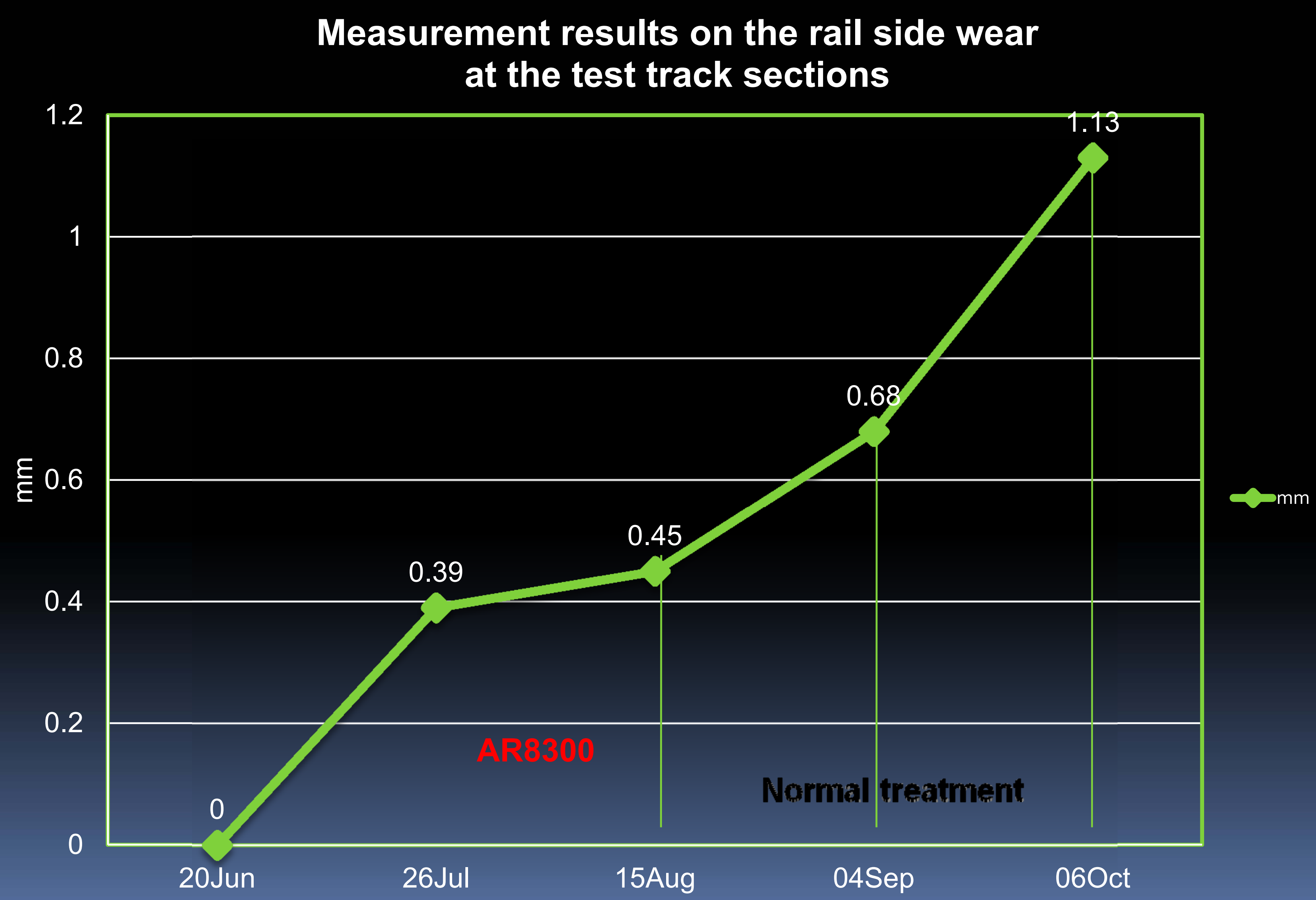
  AR8300 saved $3000.00

  Lubricant in use $450 (over 6 times less)

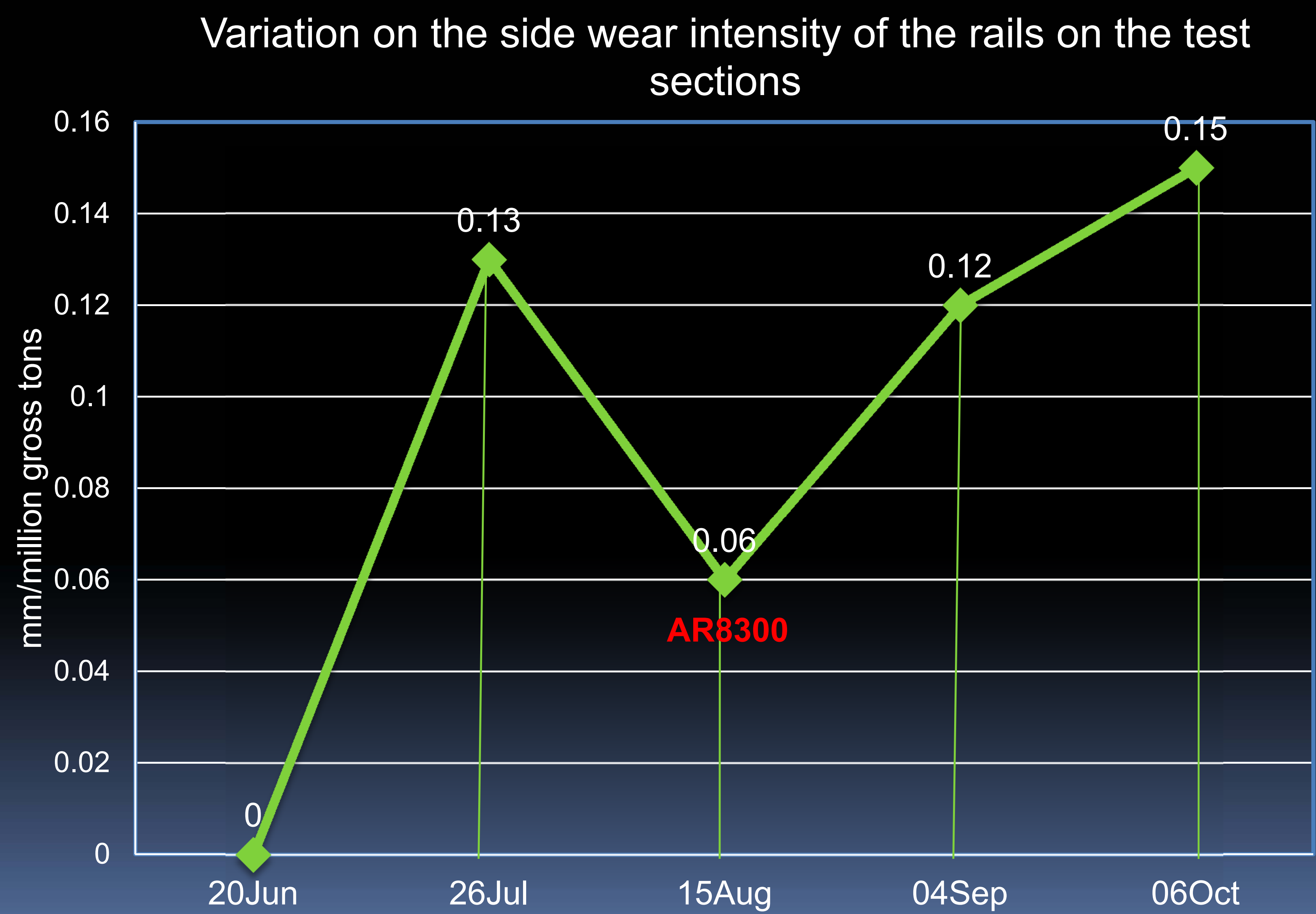
- Operational cost for same time period

  AR8300 = $1.15

  Lubricant in use = $583.00 (506 times more)



Measurement results on the rail side wear
at the test track sections
1.2
1
0.8
0.6
0.4
0.2
0
mm
1.13
0.68
0.45
0.39
0
AR8300
Normal treatment
20Jun
26Jul
15Aug
04Sep
06Oct
mm



Variation on the side wear intensity of the rails on the test sections
mm/million gross tons
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
0.13
0.06
AR8300
0.12
0.15
0
20Jun
26Jul
15Aug
04Sep
06Oct

Benefits

- Increased life on curved rail track a minimum 2X
- Increased life of wheels a minimum 2X
- Reduced lubricant usage up to 4X
- Reduce operational cost up to 5X
- Reduce noise level and the heating of rails in curves
- Reduce energy consumption
- Increased safety

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