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Top Ten Brake Myths

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BRAKE MYTHS

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This presentation will be on the SIU Automotive Technology web site to be downloaded if you want.

My 4 Favorite Brake Books

Brake Handbook

Fred Puhn (HP Books)

High Performance Brake Systems **(My present favorite)**

James Walker Jr. (CarTech Books)

Physics for Gearheads

Randy Beikmann Ph. D. (Bentley Publishers)

Brake Design and Safety

Rudolf Limpert Ph. D. (SAE Publications)

If you read, understood and could apply the material in these books you would be smarter in the area of “Brakes” than 99% of the folks working in the discipline.

The Purpose Of Doing Brake Work Should Be To Restore A Vehicle To “Like New” Stopping So Why Do We..... Believe Brake Myths? Perform Brake Work Following Myths? Not Be Really Concerned About the “Like New” Part?



•Today We Will Explore Myths In Several Areas Including

Brake Fluid

Brake Hoses

Brake Hardware

Brake Pad Bedding

Friction Materials

Pedal Pulsation

Performance Brakes

Rotors

Myth.....

- Rotors Warp
- Rotors Warp if they are stored on edge
- Rotors Warp if they are dropped
- Rotors Warp if they are cheap
- Rotors Warp (may warp) if they are extremely overheated
- Stopping Rotor Run Out Is Easy
- Rotor Thickness Inside-To-Outside Is Critical
- Ceramic Pads Never Cause Problems
- It's Easy To Clean Rust/Scale To Prevent Run Out
 - It's OK To Use Sandpaper Or Abrasive Discs
 - A Hammer and Chisel Should Never Have To Be Used
- Rotors Don't Have Transfer Layers
 - Transfer layers are good

Myth

- The Root Cause Of Pedal Pulsation Is Rotor Run Out
- Thickness Variation (TV) Is Caused By Rotor Run Out

PULSATING BRAKE PEDAL

Why Does This Rotor Have a Shiny Spot On It?



Myth – It Was Warped



The reality was that the rotor had excessive run out which cause it to “wobble” and wear at this one spot.

The result would be pedal pulsation. In this case severe pedal pulsation at moderate braking.

What Really Caused Rotor Run Out?

- One Prime Reason Is Rust and scale on



the inside or outside of the rotor hat. Always clean the rotor hat before reinstalling a used rotor back on the vehicle.

Myth – Rotor Position Mounting Doesn't Matter

Some OE's match mount within a .0001 on new vehicles
Always mark a used rotor's position and return it to the same position

So what do you do when installing a replacement rotor? You



Myth – It Doesn't Matter How You Clean a Hub



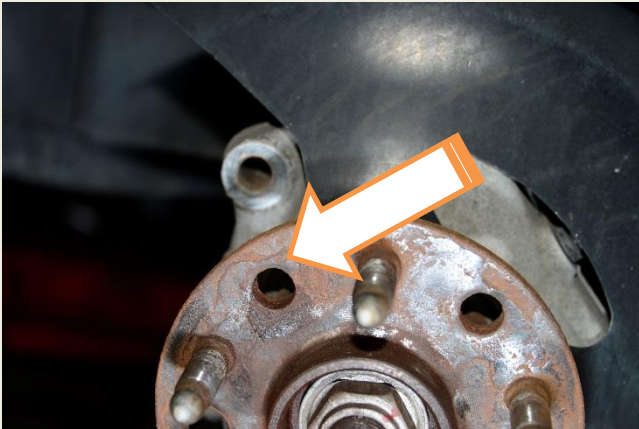
Best Method
This method removes rust and scale without removing any metal from hub face.



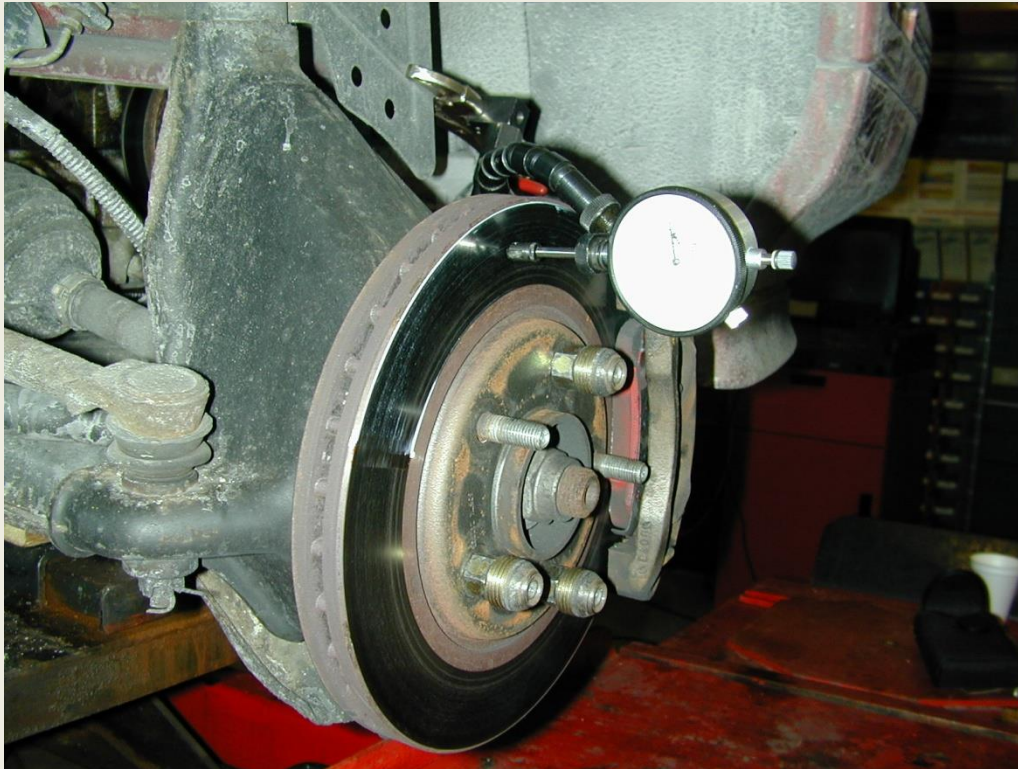
Not As Good
This method can easily remove metal which is just like rust build up. It will cause rotor run out issues.

Myth

A Hammer and Chisel Is Never Needed to Clean A Hub Face



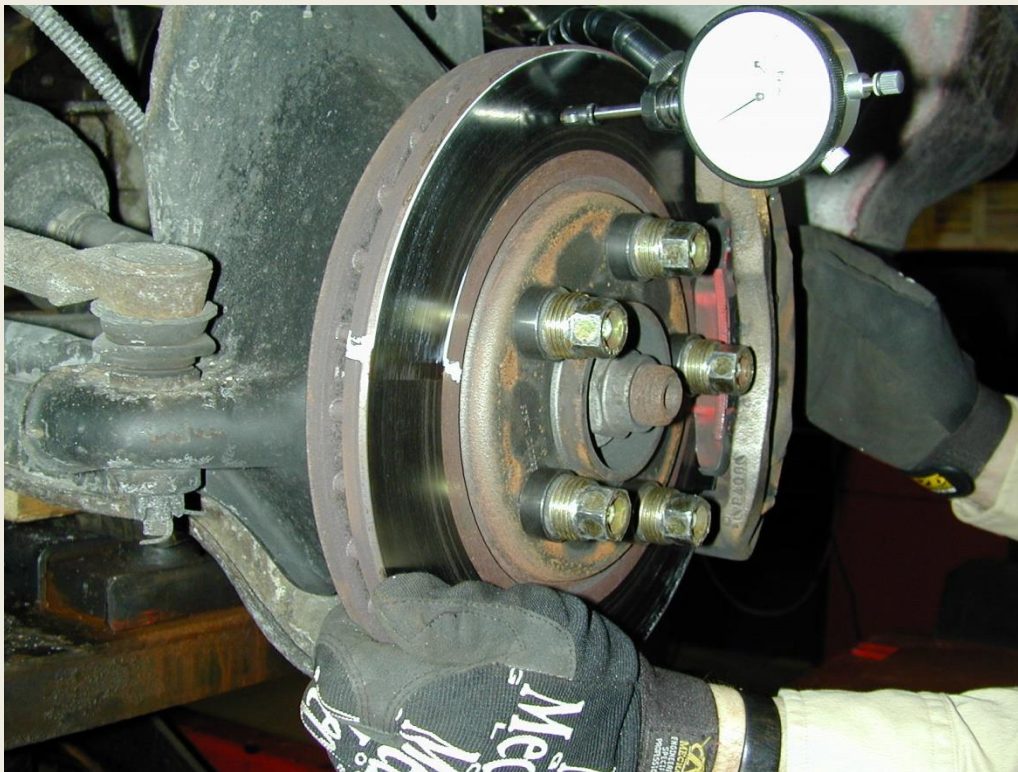
Myth – It Doesn't Matter How You Tighten Down a Rotor to Take Run-Out



The only thing right about this picture is how the dial indicator is mounted.

The rotor clamp method is completely wrong and will cause a error in run out.

Myth – It Doesn't Matter How You Tighten Down a Rotor to Take Run-Out



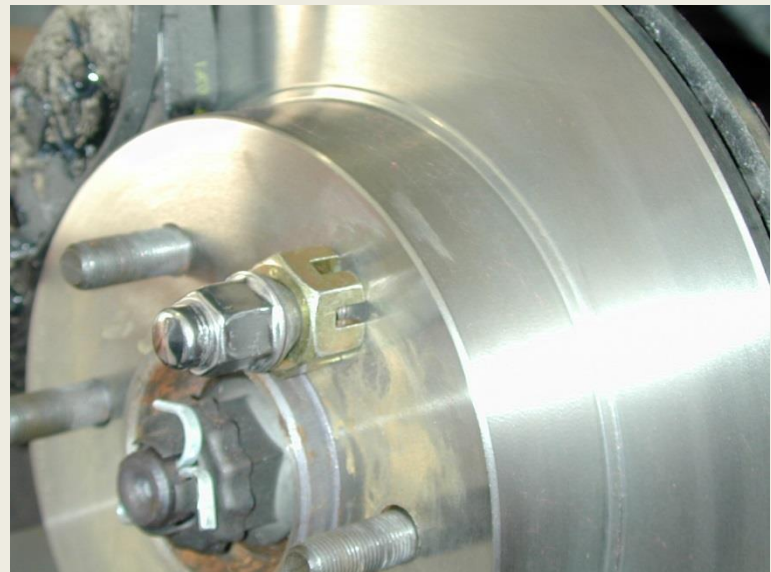
If you don't use the right pre-load adapters behind the lug nuts you will have an erroneous run-out reading.

Myth – It Doesn't Matter How You Tighten Down a Rotor to Take Run-Out

Right, use these behind the lug nuts



Wrong



Proper Tightening Of a Rotor Onto a Hub to Take Run-Out



Hub Run Out Causes Rotor Run Out

- Use a dial indicator to take hub run out
- If a hub has only a slight amount of run out it can still lead to a pulsating pedal problem
- The best way to cure a pulsating brake issue, especially a reoccurring pedal pulsation problem is to

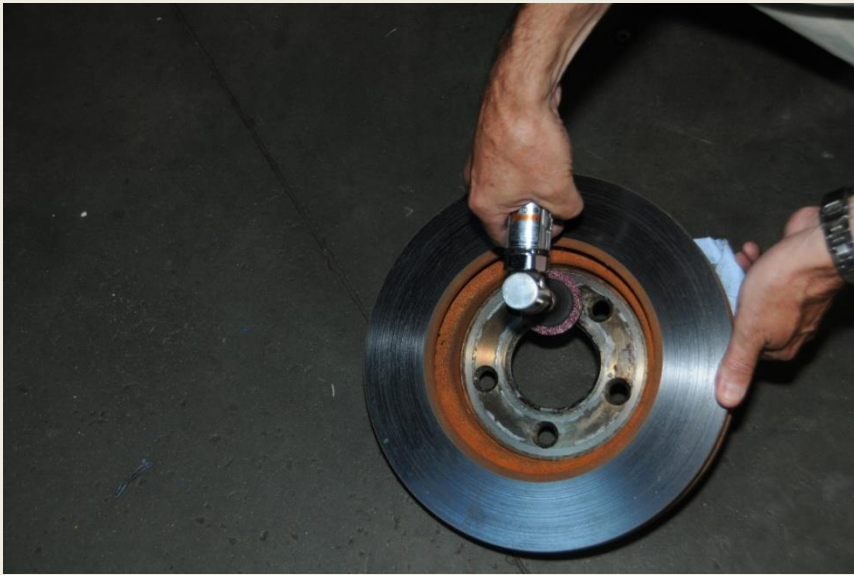
Compensate for hub run out. Do this by using a on-the-car lathe or a behind the rotor run out adjustment shim.

A On-The-Car Brake Lathe and Lateral Run-Out Correction Plates Both Solve Run Out Issues

- That doesn't mean you can short cut anything



You Must Still Go Through The Steps



Using a On-The-Car Lathe to Turn a Rotor On A Vehicle Takes The “Stacked” Tolerances Into Consideration



Installing a Lateral Run Out Compensation Plate Takes The “Stacked” Tolerances Into Consideration



Lubrication on Hub Faces and Inside Rotor Faces..... A Point of Controversy

Myth:

It's wrong to lubricate these points
Then why do Ford and other OE's do it?



Myth – It's Not Necessary To Coat The Hub Face Before Installing A Rotor



The reality is that many OE's (especially Ford) coat the hub face area to prevent rust and scale build up. Other OE's have a protective plating on the hub face but that has a tendency to wear off and rust then forms causing "rust jacking" problem.

Coat the hub face when installing or reinstalling a rotor. It's a good preventive measure.

Myths About Drilled & Slotted Rotors

Drilled and slotted or drilled or slotted rotors supply more stopping power to a vehicle (myth)

Drilled rotors wear brake pads more rapidly (myth)

Slotted rotors cause more rapid pad wear (true)

There are no advantages to drilled and slotted rotors on street driven vehicles (myth and true depending on vehicle usage)

Drilled and Slotted Myths



It doesn't make any difference if the slots go to the to the rotors edge (myth) It makes a major difference

This rotor will provide increased stopping power, shorter stopping distances and always run cooler compared to a similar non-drilled/slotted rotor (myth)



PERFORMANCE BRAKES

Myth: Bigger is Always Better

- Will increasing rotor size increase your braking performance?
- It can, but the right pad is needed too!
- What are you trying to control?

HEAT!



Myth: Bigger is Always Better

- Larger Brakes can reduce brake temperatures
 - Used for street applications this can actually prevent the brakes from working properly because the pads don't reach operating temperature
 - Stock brake temperatures are typically lower than 500°F
 - In race applications adding heat is typically not a problem
 - Race Pads may be designed to operate in excess of 1000°F
- Using a “race” or “performance” pad may actually produce worse braking due to cooler operating temps

Myth: Bigger is Always Better

- In most cases the larger rotating mass is not worth the minimal braking performance gain vs. a quality performance pad and rotor combination in the stock size
- Did you consider the brake balance in the vehicle?



Myth: Race cars have them, they must be better

- Cross drilled Rotors: Myths

- Cross drilled rotors will keep my brakes cooler
- Cross drilled rotors will improve braking performance in a street application



Myth: Race cars have them, they must be better

- Cross drilled Rotors: Myths

- Cross drilled rotors will keep my brakes cooler:

FALSE: the cross drilled holes were designed to release gasses from the brake pads

In most cases brake temperatures will stay the same due to some increase in airflow along with the reduced mass and “heat sink” abilities of the rotor

- Cross drilled rotors will improve braking performance in a street application

FALSE: due to the reduced surface area of the rotor the coefficient of friction can DECREASE

Myth: Race cars have them, they must be better

- Slotted Rotors: Myths

- The slots will cause excessive pad wear

YES, In most cases the slots can reduce glazing and keep the pads clean. This can actually improve stopping ability but may accelerate pad and rotor wear



Be careful of slots that go completely to the edge of the rotor.

Myth: Race cars have them, they must be better

- So what would you recommend?
 - Some things to consider:
 - Most “experts” recommend slotted rotors if you must go to a performance part for the street
 - Most racing applications today (NASCAR) will use slotted, not drilled rotors. If the improvement was so great wouldn't those engineers use them?
 - For high speed racing drilled rotors might improve braking, but you will be replacing rotors more often
 - In most cases when new vehicles have drilled rotors it is for no other reason than looks

Myth --- Using A Torque Wrench Will Always Prevent Rotor Problems

Only if the torque wrench is in calibration

Only if the torque wrench is properly used

Only if the correct torque spec is used



Myth – Just Replace Rotors Don't Ever Turn Them

Myth – All Rotors Are The Same, Some Just Cost More

- The Following Are All Incorrect Brake Myths
- If O.E. is a damped iron rotor you can use any type of replacement rotor
- There is no quality difference or make up difference is new rotors
- All new rotors have the same RA finish on them
- You can take all new rotors out of the box and just install them without doing anything else

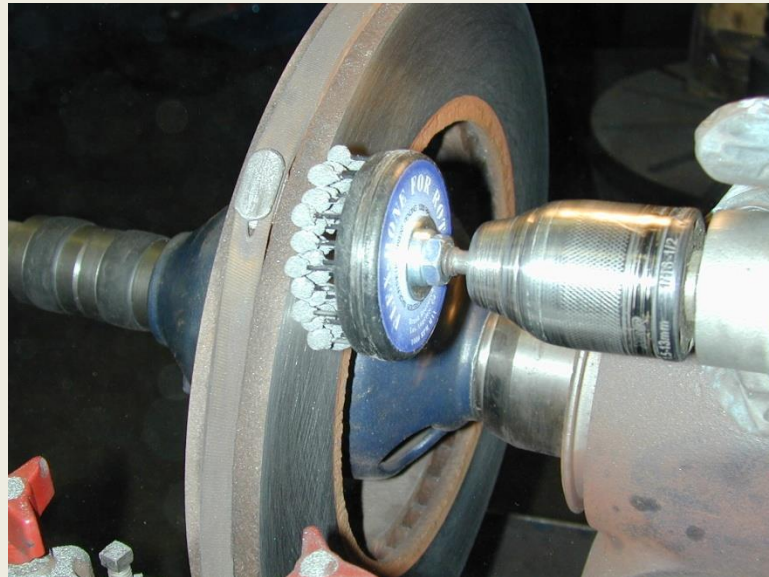
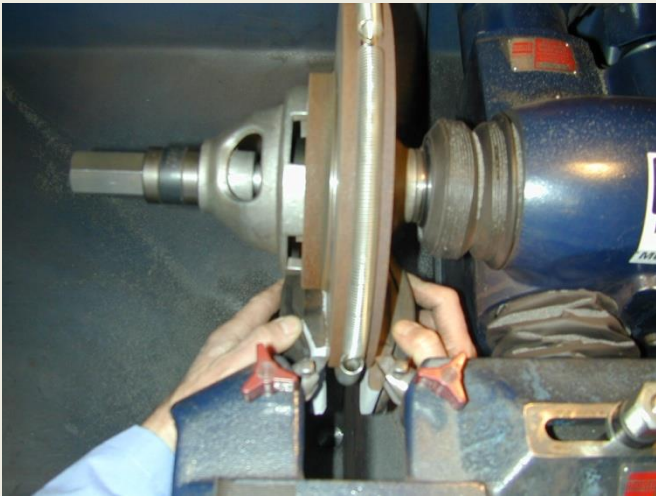
Myth – Brake Cleaner Products Are Ok To Wash Rotors With

- True or False
- Both answers are true but the final wash should be with soap and water. Why????



Myth – A Non-Directional Finish Isn't Necessary On a Turned Rotor

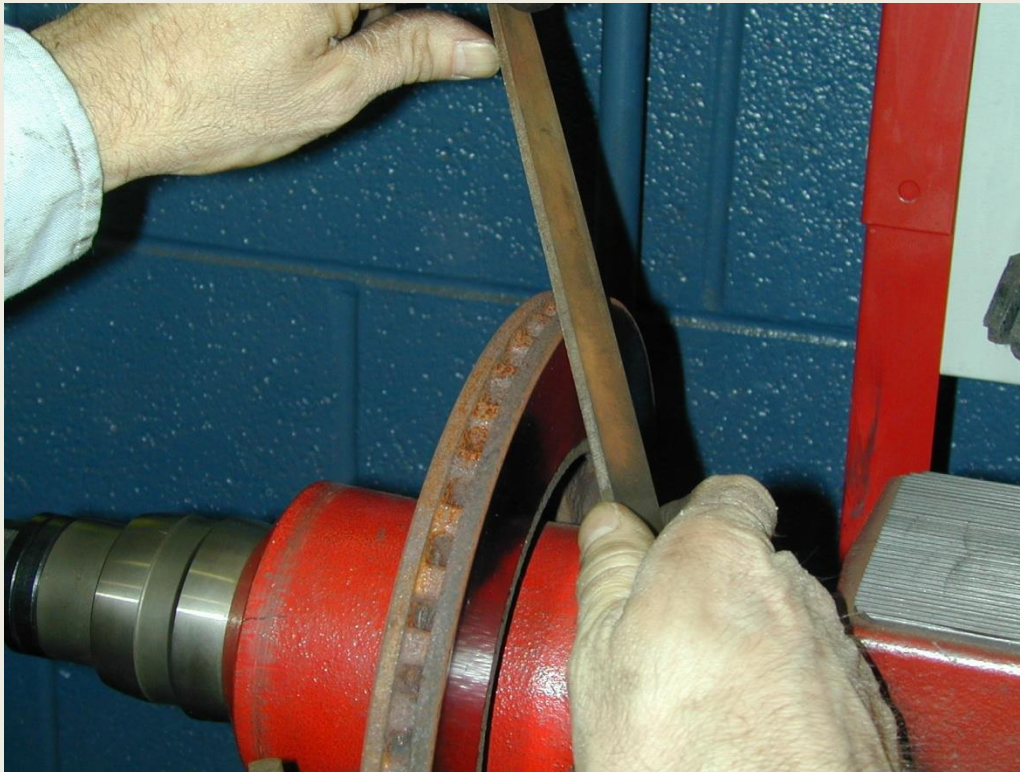
No matter how smooth a cut you put on a rotor you should always apply a non-directional finish to a turned rotor.



Rotor Service Tip

Before you cut a rotor on your lathe take a file and knock off the outer rust ridge. This will GREATLY extend the life of your lathe bits.

Also you MUST always use a vibration damper of some type when turning a rotor.



Myth – A Rotor Must Have Equal Amount Of Metal On Both Sides

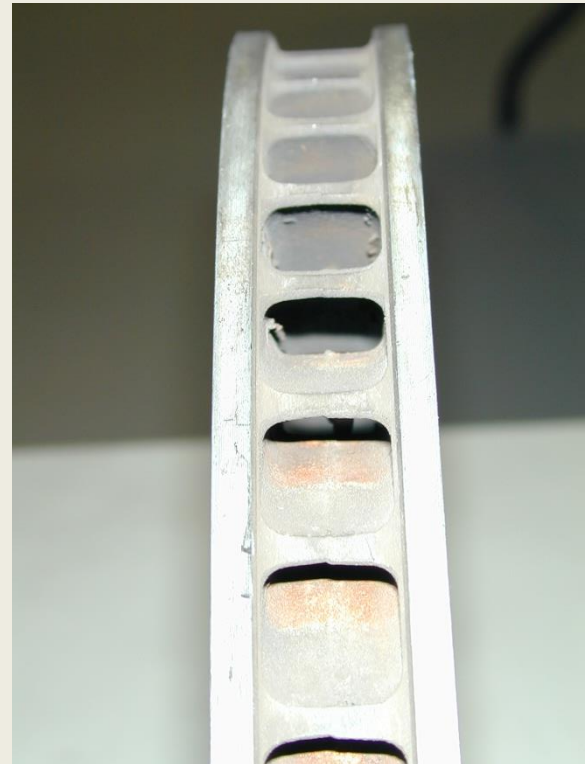
- True or False
- When you turn a rotor use common sense but provided the rotor is above minimum specs the amount of metal on each side is not that critical
- Some O.E. configurations have more metal on one side of the rotor than the other



Myth – You Don't Have To Match O.E. Fin Design On Replacement Rotors

If you don't you may easily have a cooling issue which could lead to a pulling brake

Cheap replacement rotors may not have the same number of fins or the same amount of metal in the center section of the rotor



Myth – It's Easy To Tell The Smoothness of a Rotor (RA Value)



You can't run a ball point pen across a turned rotor and tell how smooth it is

You can't drag your finger nail across a rotor and tell how smooth it is

You can only tell how smooth a rotor is by using a profilometer to tell RA

Myth – Spray On Rotor Treatments Are.....

- Good and should always be used
- No good and should never be used
- Can be used if you wish without any problems
- Who really knows



FRICTION MATERIALS

BRAKE PAD BEDDING

Myth: Test Drives After Installing New Brakes is Only to Verify the Car Stops

- Brake bedding is as important as using assembly lube in a new engine.
- What is brake bedding and what does it do....
- Ever hear of the term “Transfer Layer”

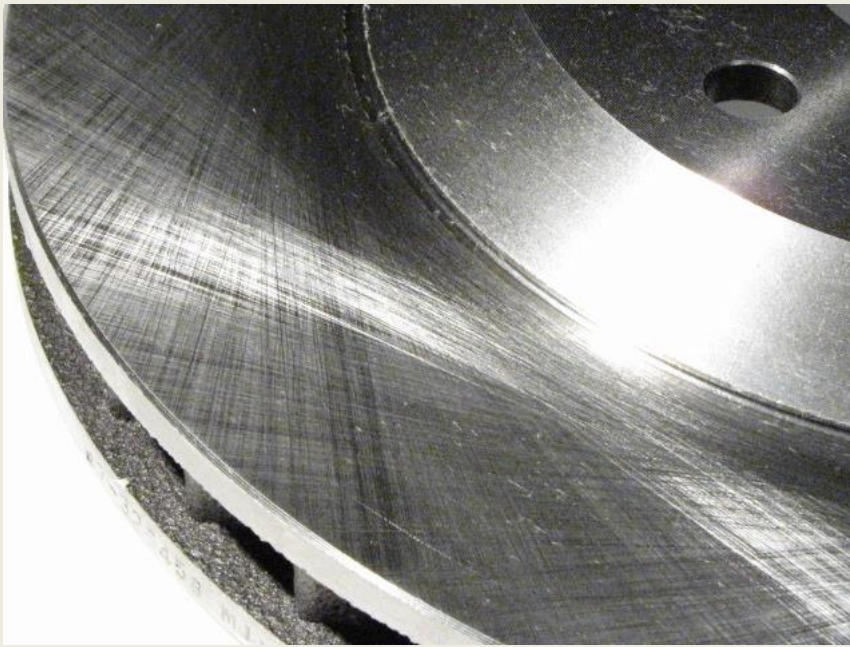
Myth: Test Drives After Installing New Brakes Are Only to Verify the Car Stops and Perhaps Doesn't Pull

- The transfer layer is micro-thin layer of material
- This material is generated by the rotor and pad interacting while in motion
- The transferred material has a direct influence on the coefficient of friction and stopping ability
- All pads and rotors need to mate

Myth: Test Drives After Installing New Brakes is Only to Verify the Car Stops

- Bedding procedures may vary between pad manufacturers, consult your supplier for directions
- A sample procedure from a NAPA bulletin:
 - 15 stops from 35 to 40 MPH down to 5 MPH
 - Allow brakes to cool for 30 seconds between stops
 - Try to avoid panic stops or hard braking for approx. 200 miles
- Some procedures, Raybestos, for example also recommend braking events from higher speeds
- Note: These procedures DO NOT want you to stop the vehicle between brake applications, the area between the pad and rotor will stay hotter causing “hot spots”

Myth: Test Drives After Installing New Brakes is Only to Verify the Car Stops

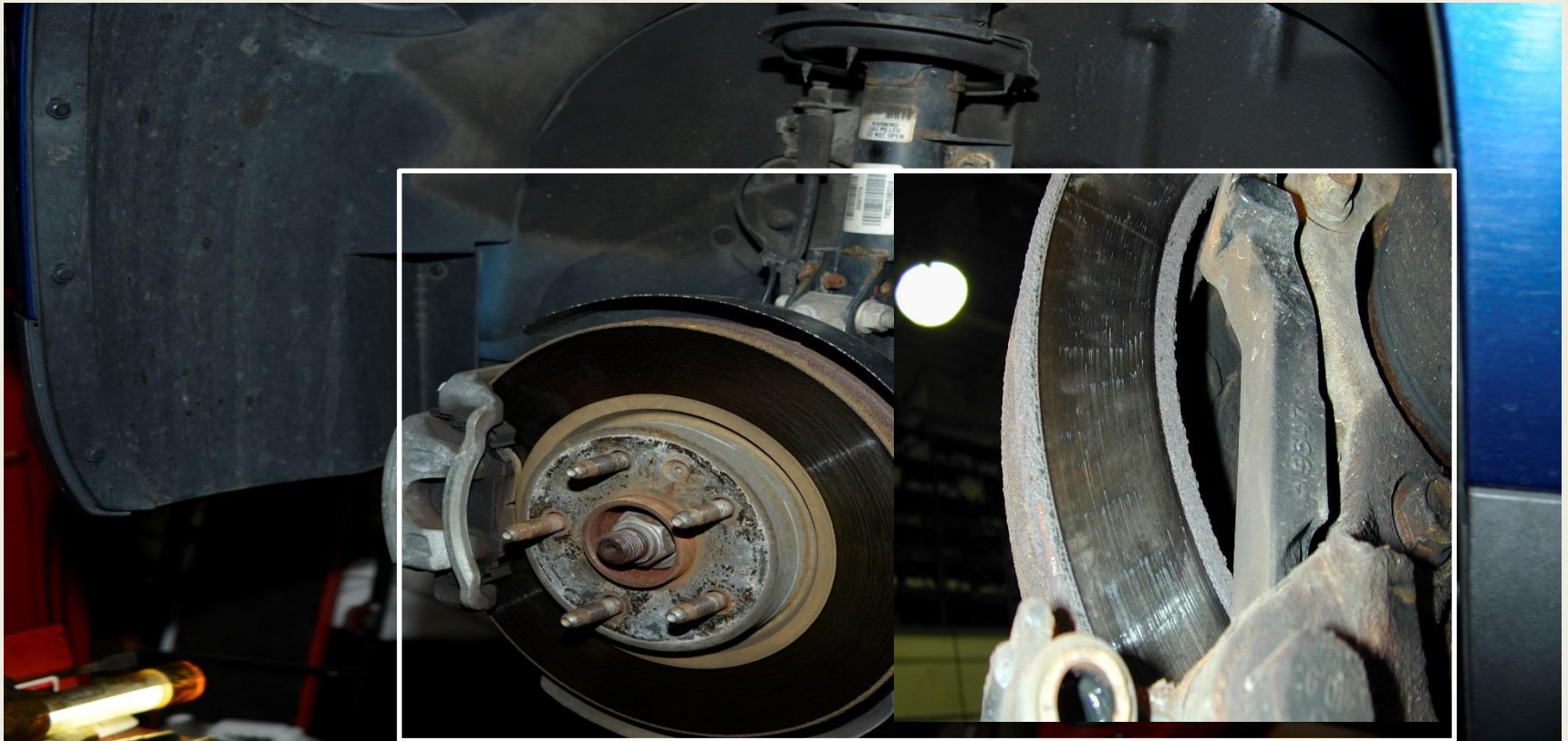


New Rotor



Same Rotor After Bedding

Myth – The Deposit of a Transfer Layer Is Always Good



Transfer Layers Can Be Problematic

- When you have a irregular transfer layer.....
 - Don't just replace the pads or rotor
 - Determine the root cause
 - In the picture shown it was a over heating problem



Myth: Ceramic Brake Pads Never Cause Problems



Myth – A Vehicle Will Never Have A Brake Problem If The Vehicle Isn't Being Driven



This Vehicle Is Normally Parked For 3-Weeks At A Time. Semi-Met Pads Used On This Truck



Hydraulic Brake System Myths

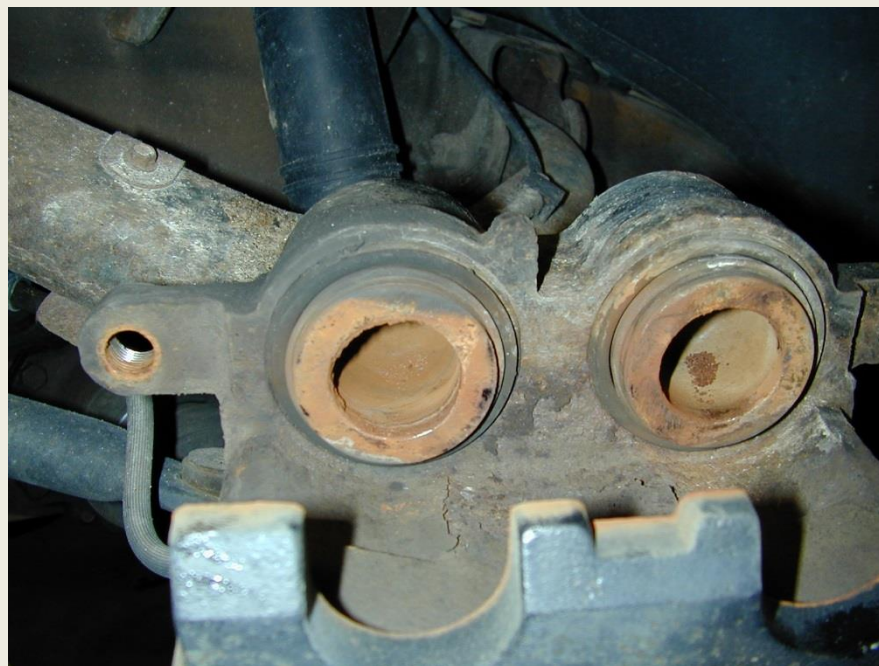
Multi-Piston Calipers

Apply equal hydraulic pressure to all pistons (This is true)

Pad apply pressure will be therefor be equal across the entire pad (Myth)

Some late model vehicles use two different size caliper pistons.

Multi piston calipers have more stopping power (myth)



BRAKE FLUID MYTHS

Myth: You

- Never have to change brake fluid
- Can tell how good brake fluid is by it's color
- Moisture is the main problem with brake fluid
- Don't know how good brake fluid is because there is no way to test it except for moisture
- Should be really concerned about dissolved mineral content of brake fluid (True, not a myth)

Myth – You Can Tell How Good Brake Fluid Is By How It Looks



False, the brake fluid shown here passes every SAE test in existence. It looks bad but appearances can be very deceiving.

Says Who???

- This picture caption from a Dec. 07 national magazine article is 100% wrong.

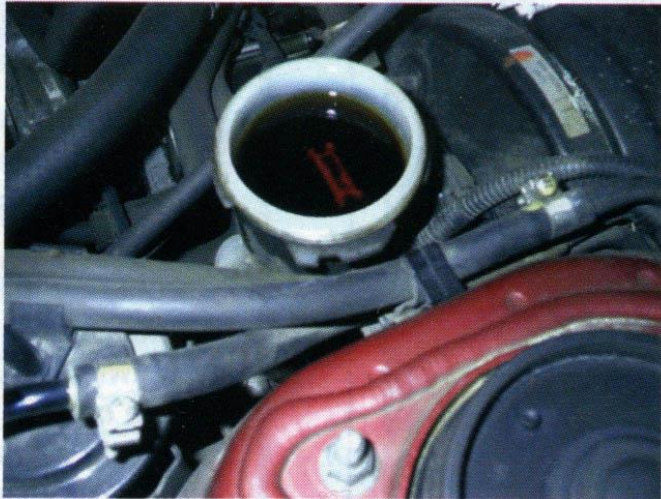
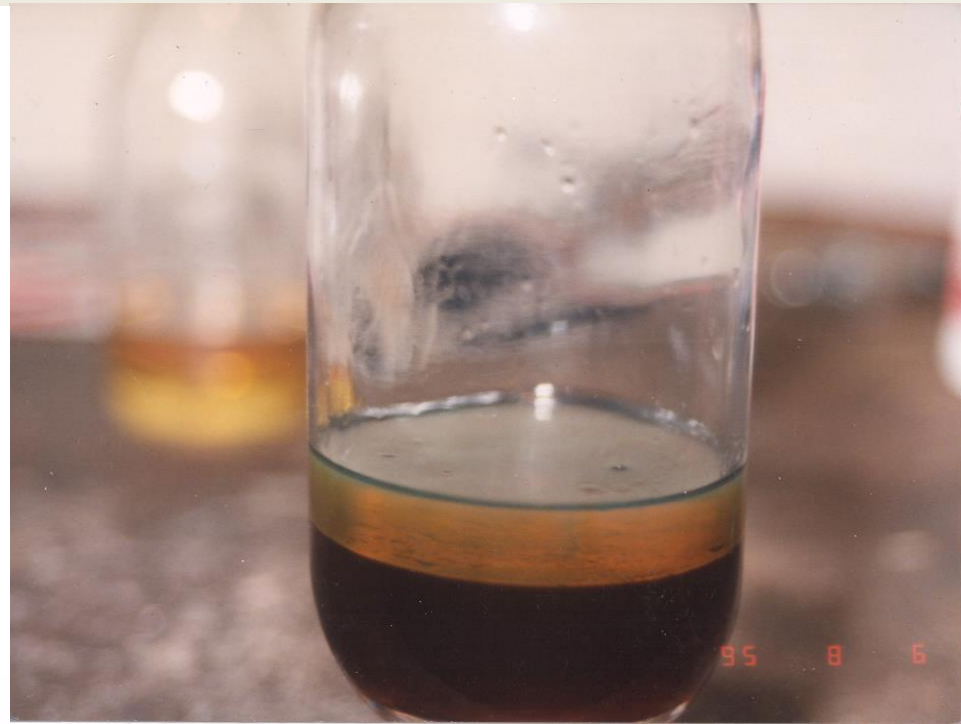


Photo 8: This is not the proper color of brake fluid.

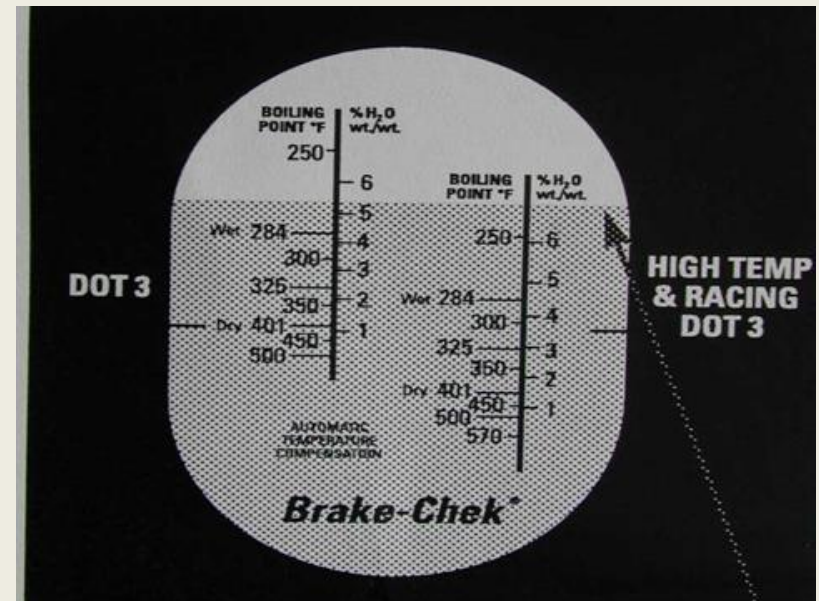
Petroleum Based Contamination is a Different Story



This is Petroleum Based Contamination



Myth –Only Test Brake Fluid For Moisture



Busting The Brake Fluid Testing Myth



Dissolved Minerals Test Shows...



BRAKE HOSES

Myth – Brake Hoses Need Immediate Replacement When They Are Cracked

- Any cracking that you can feel mandates replacement (myth)
- The outer layer (the one that cracks) is there to protect the inner “pressure” layer
- MAP (Motorists Assurance Program) says minor cracking is allowed
- Cracking means the hose will fail the “whip” test which mandates replacement (myth it may fail not will fail)

Myth – This hose is bad



Yes but not because of the cracking.
There is rust and scale inside the bracket
which holds pressure on after releasing
the pedal

Common sense and good preventive
maintenance would suggest that the hose
be replaced as the cracking will only
continue to get worse but you
can't say this is unsafe

Myth – Heating A Steel Brake Line To Remove It Is OK



Never use a torch to heat a steel brake line to flexible hose connection joint. You will at the least loosen the crimp of the hose end.

Myth – It's Bad to Use a Line Lock/Clamp on a Flexible Brake Hose



Using a round line lock and finger tightening it does not cause any problems but



Myth – It's Sometimes OK to Use a Locking Pliers To Pinch Off a Brake Hose



No, No and if you didn't understand ,NO. The reason why is

.....

Myth – If You Use Very Light Pressure a Locking Pliers Is OK



Do this and

.....

YOU MAY EASILY GET THIS



Vise Grip Was Clamped In This Area.

Class Bonus Photo

This is a actual photo of a hose with a “flapper” in it that allowed brake fluid to flow in one direction but not back in the other direction.

Most often this fact is illustrated by a line drawing not a photo.



Myth – It's OK To Let a Caliper Hang By The Hose For A Few Seconds

Again, No, No and if you weren't listening
NO



Myth – Braided Flexible Brake Hoses Are Not DOT Approved

- Some are
- Some are not
- It's depends on the machine/system doing the crimping
- It's depends on the hose and ends used



Myth – If A Brake Hose Was Twisted It Must Be Replaced



If the hose is old or has been like this for some time yes, otherwise simply reposition it correctly.



BRAKE HARDWARE

&

Brake Component Lubrication

Myth – Wheel Brake Hardware & Return Springs Will Last The Life of the Vehicle

First let's define hardware as anything on a brake system that isn't friction or hydraulic and is located at a individual wheel, RF, LF etc.

- It may if it's not rusty
- It will on light weight vehicles
- If it passes the “twang” test
- If it hasn't been overheated

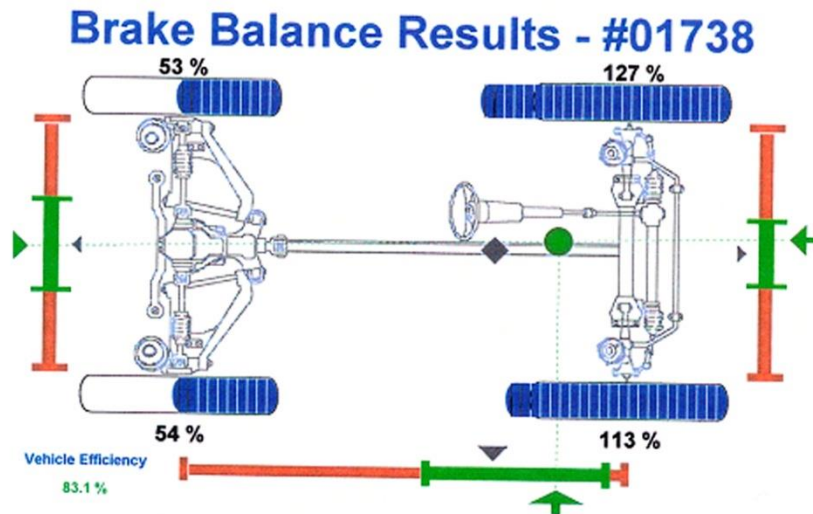
- Wait!!! You don't know what the “TWANG” test is?

- Well what you do is take a brake shoe return spring in your hand and then you.....

Myth – You Can Tell The Condition Of Brake Hardware By Looking At It

- Sometimes “yes” and sometimes “no”
- What if it’s missing or is a accessory item?
- Because it doesn’t look shiny it’s bad
- Because it is shiny it’s good

Brake Hardware Can Easily Cause Brake Performance Problems



Cleaning Brake Hardware With a Wire Wheel Is Just Simply Wrong



New Clips Didn't Come With The Pads So.....

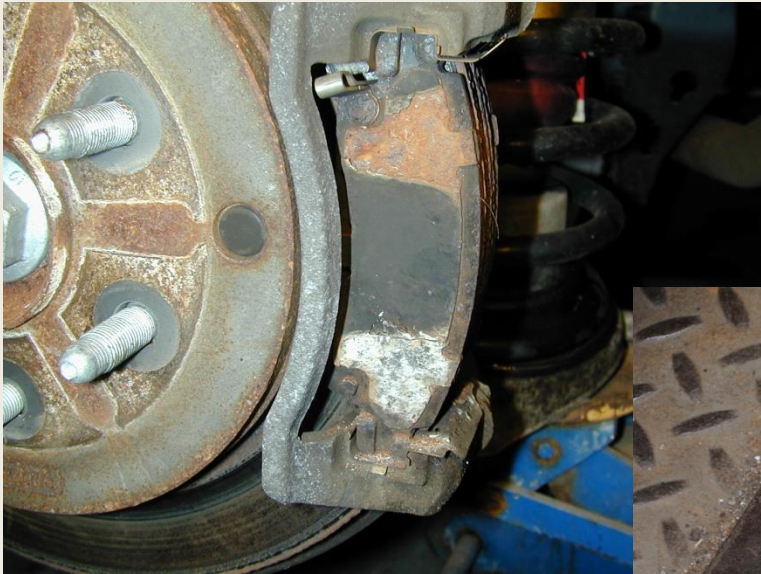


But why is it bad? Let's just clean it up on a wire wheel and reuse it



After all if I should be replacing the hardware it should be included with the pads. "Says Who"?

Replacement of Brake Hardware Sometimes Includes Caliper Brackets



Brake System Parts Lubrication

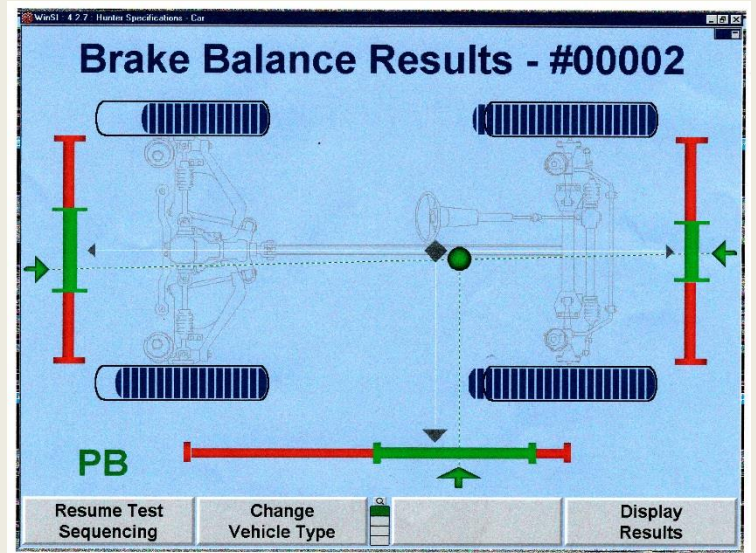
Many people believe that there is only one type of brake lubricant that needs to be used on all necessary lubrication points.

Lubrication point categories-----

Metal-to-Metal

Metal-to- non metal contact points

Most believe this a myth.....usually two types of lubricants are required!





The type of brake grease you use should be governed by:

The operating temperature requirement

The contact load of the parts

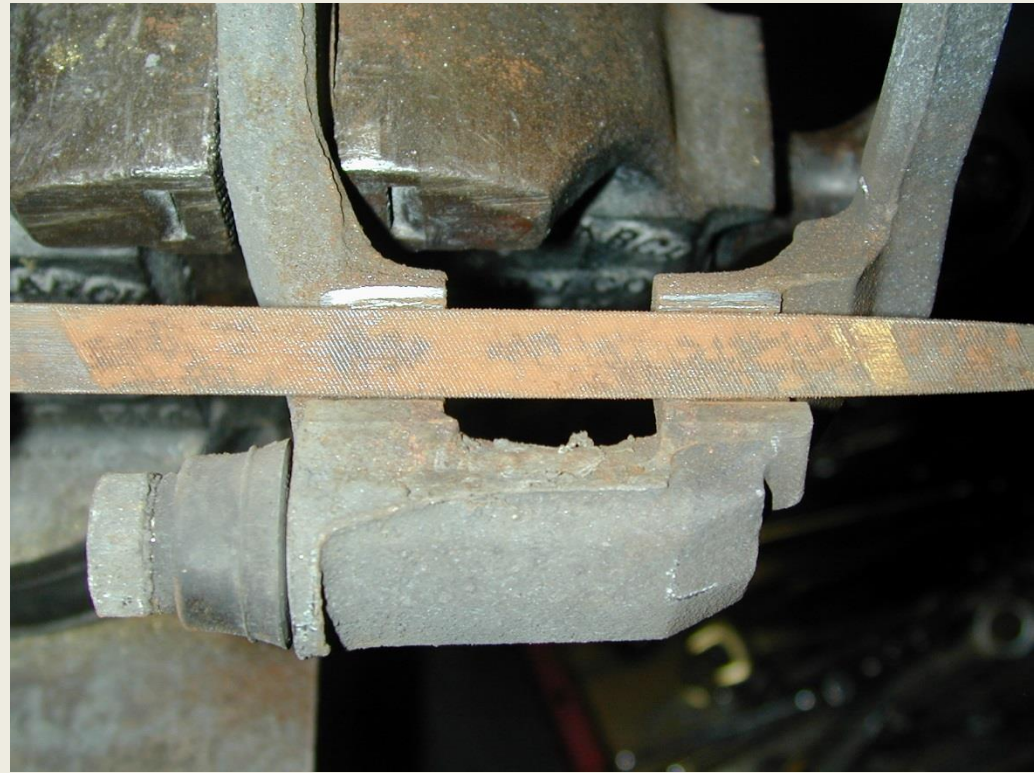
Common sense



Myth You Can Clean Up Slides With A Wire Brush



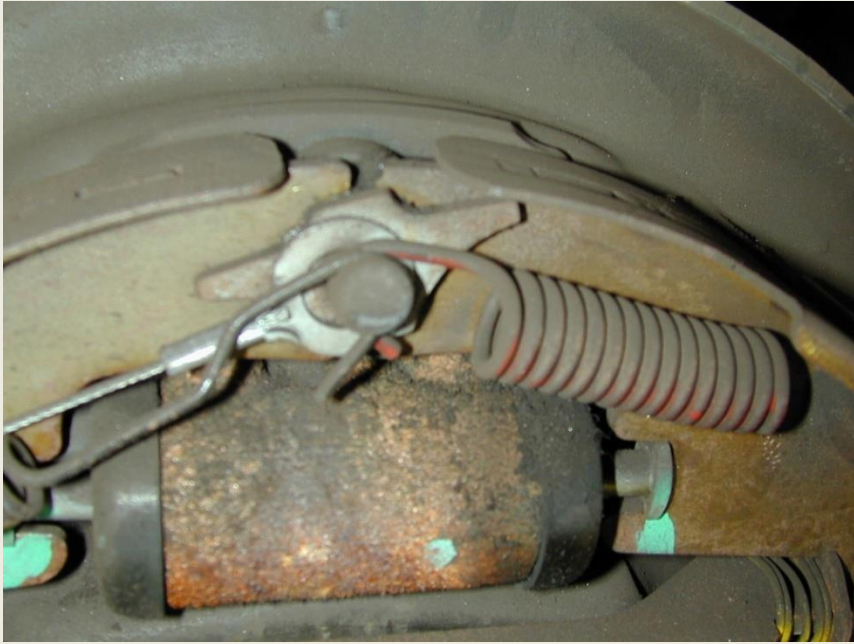
Lack of lubrication causes metal fretting wear on the caliper slides



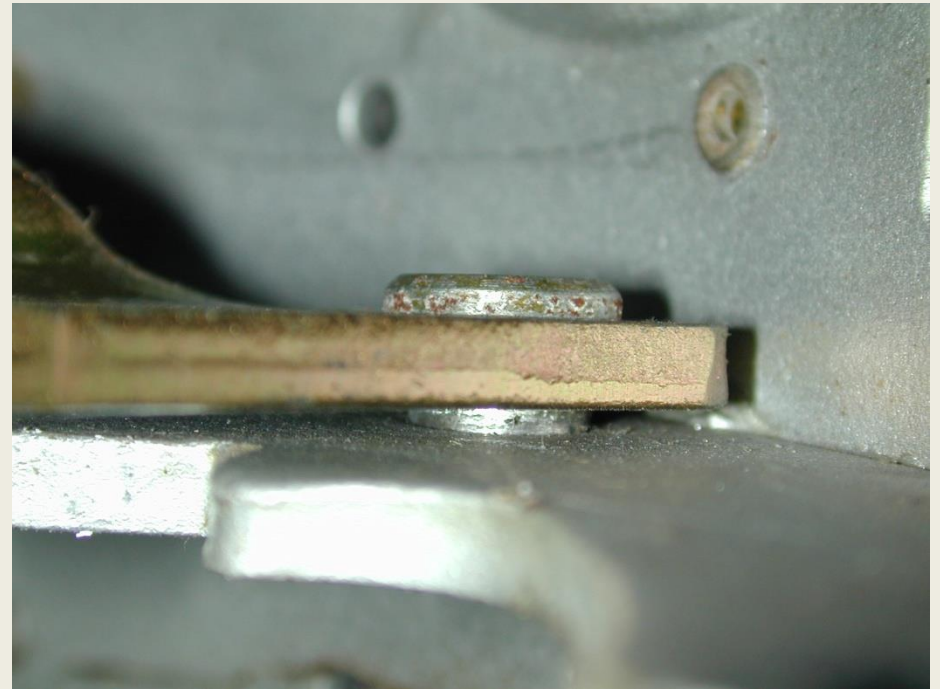
Truth...you must be able to rock a dual-servo brake system side-to-side or there is a problem.



Your Thoughts



Your Thoughts



Thanks For Attending

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