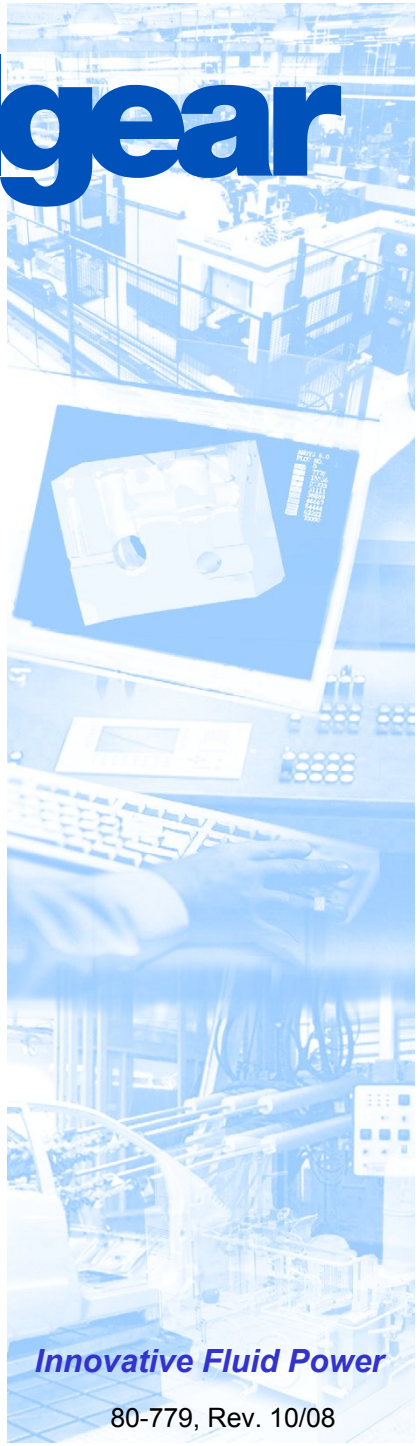
Oilgear

Proper Pump Installation Practices



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80-779, Rev. 10/08

There is a Reason Every Unit Comes With This Bright Orange Tag !

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Proper Alignment and Coupling Installation

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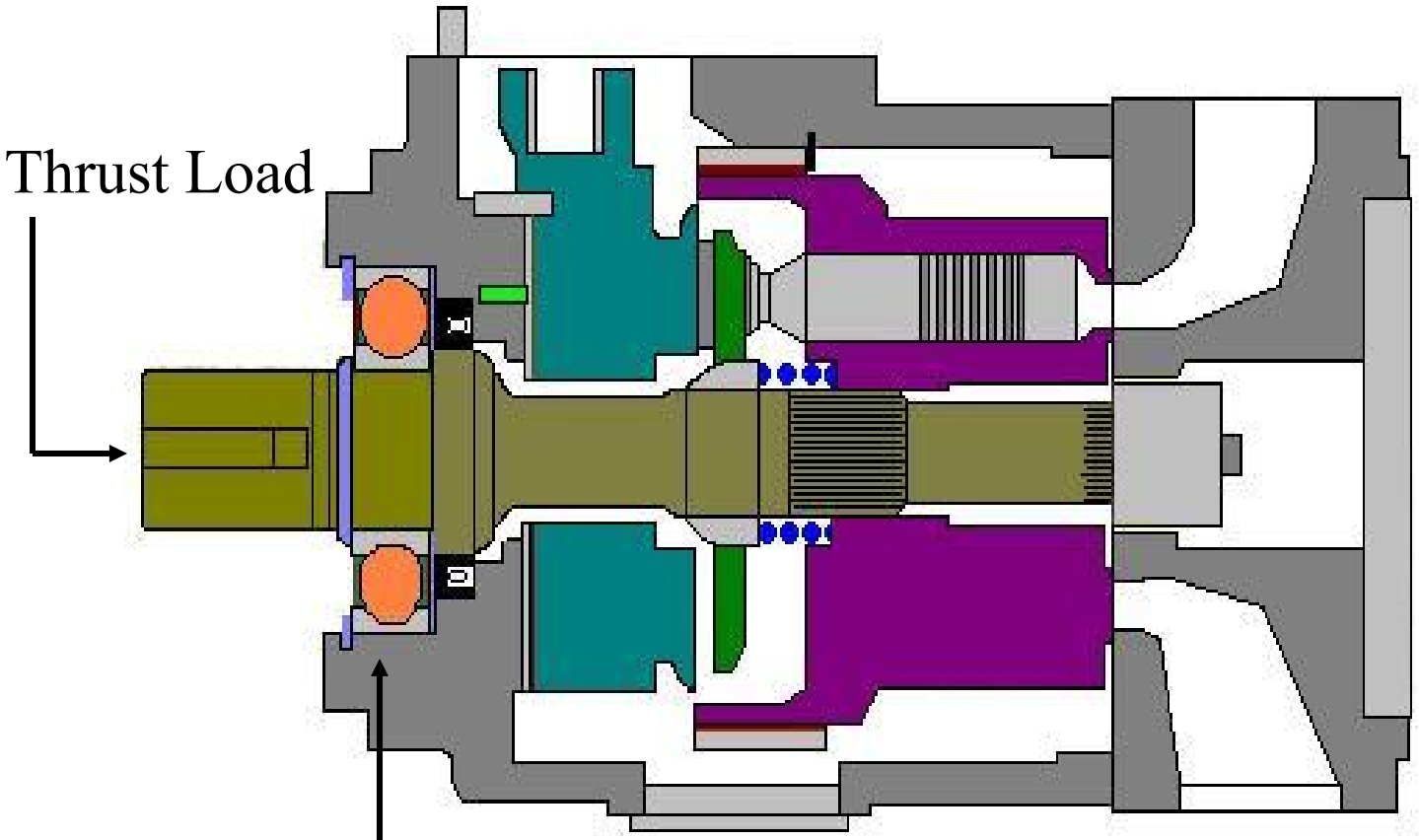
- Do Not Drive Coupling Onto Shaft
- Pump Alignment Must be .005” TIR
- Make Sure Coupling Halves are Not Touching
  - *Can Induce Thrust load and Misalignment
- Use Keyed Shaft for Industrial Applications
  - *Oilgear Standard Splines are Designed to be Loose
  - *Do Not Use Split Spline Couplings

Bearings are Designed to Carry Side Loads Not Thrust Loads



Driving on a coupling or coupling halves touching - Creates a thrust load, damaging balls and race's of front bearing.

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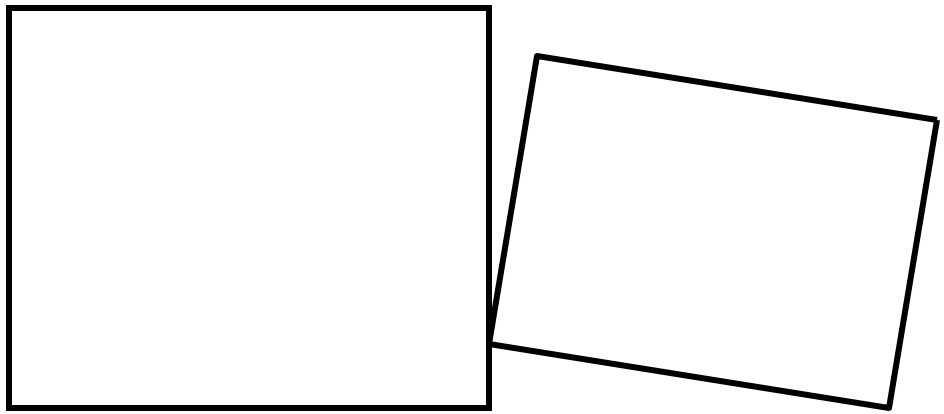
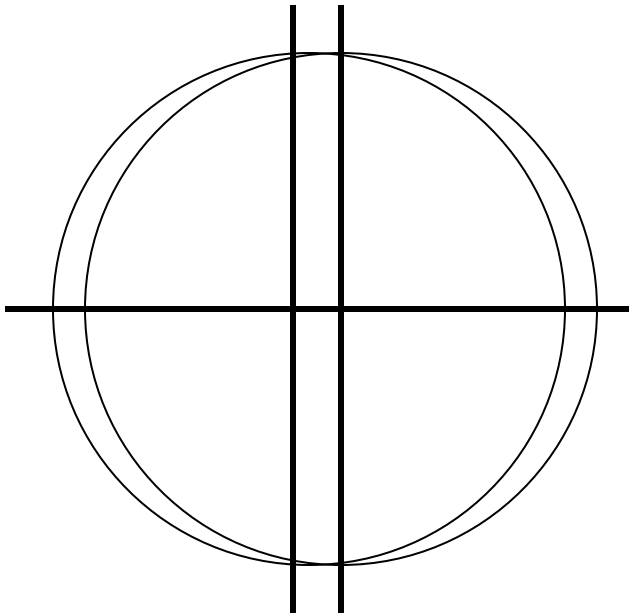
Pump Alignment: TIR Means Total Indicator Reading



Perpendicularity



Concentricity

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Effect of Misalignment

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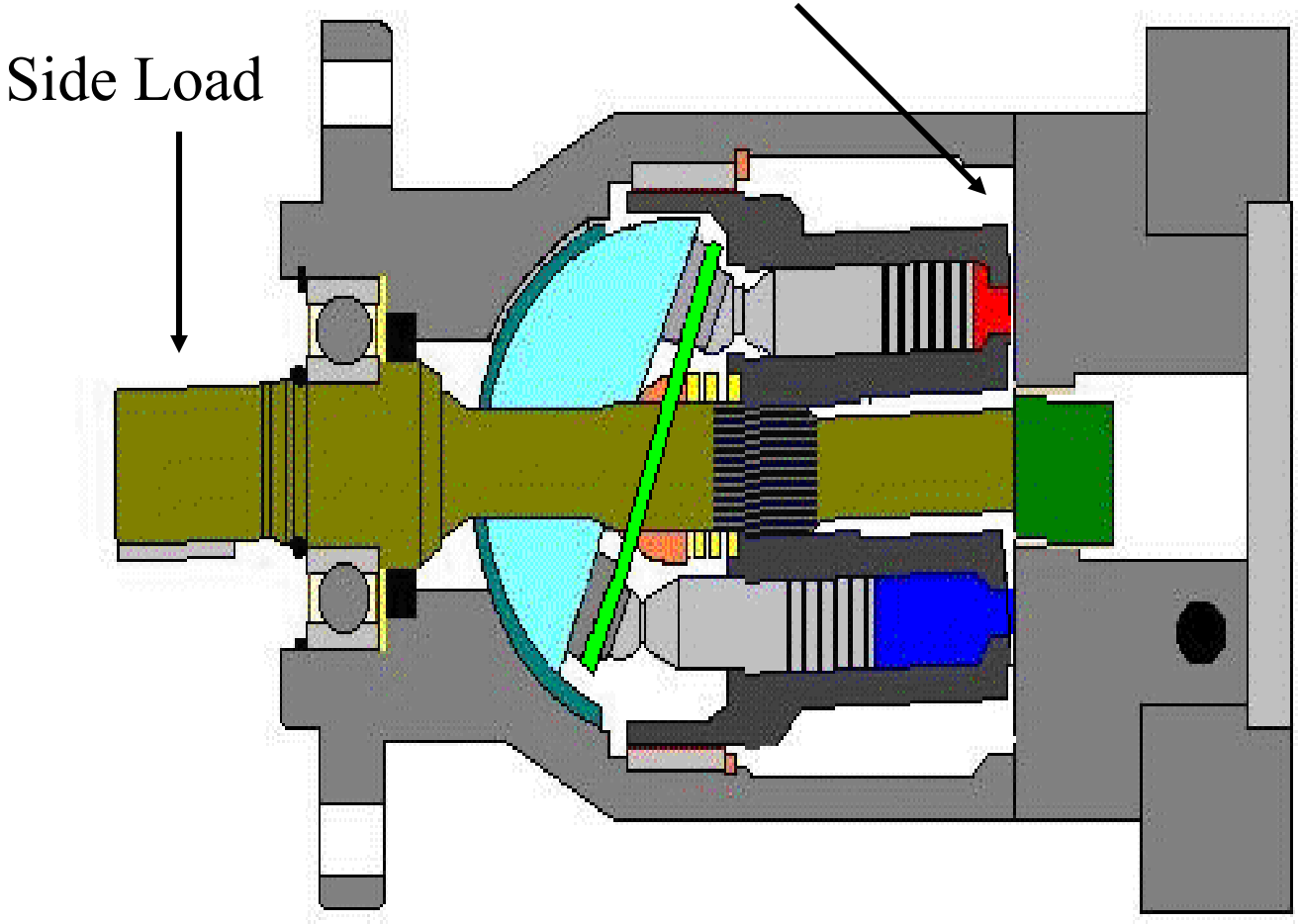

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Split Couplings Can Cause Misalignment

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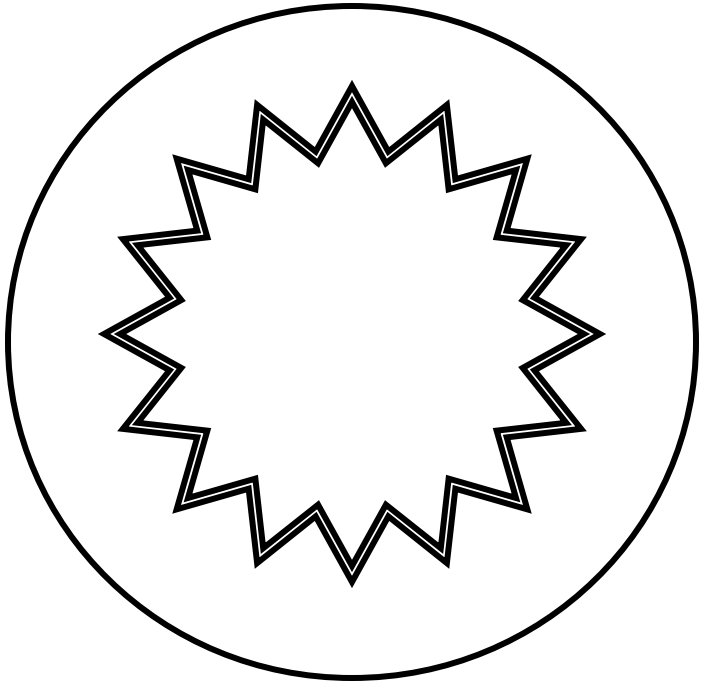
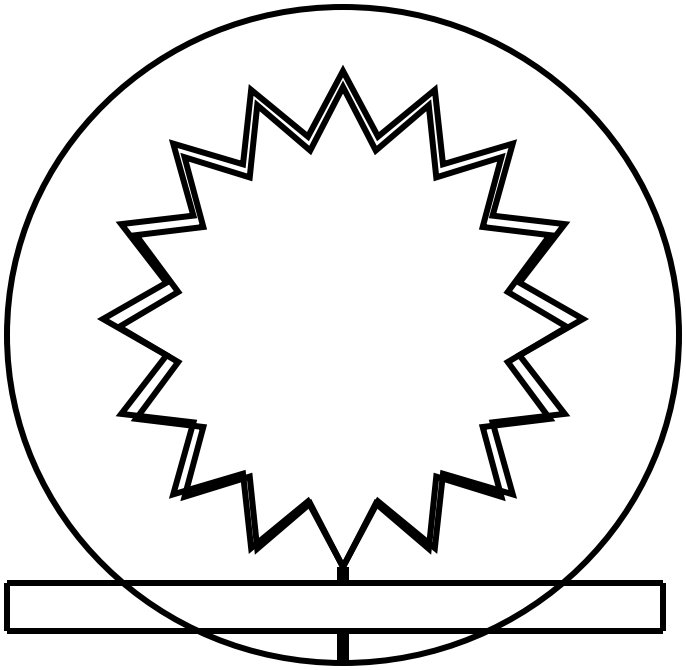
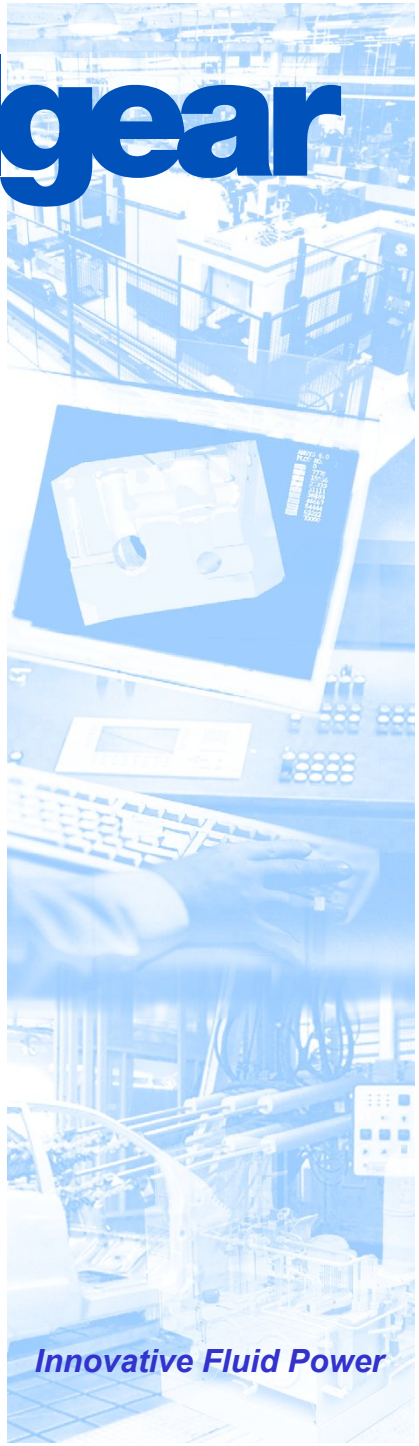
Splines are Free to Self Align



Splines are Not Allowed to Self Align





Case Drain Lines

- Lines Must be Full Size
- Lines Must be Unrestricted
- Lines May Not be Connected to Other Return Lines
- Lines May Not be Connected to Filters, Coolers
- Lines Must be Plumbed so that Case Remains Full at All Times
- Lines Must be Terminated Below Oil Level

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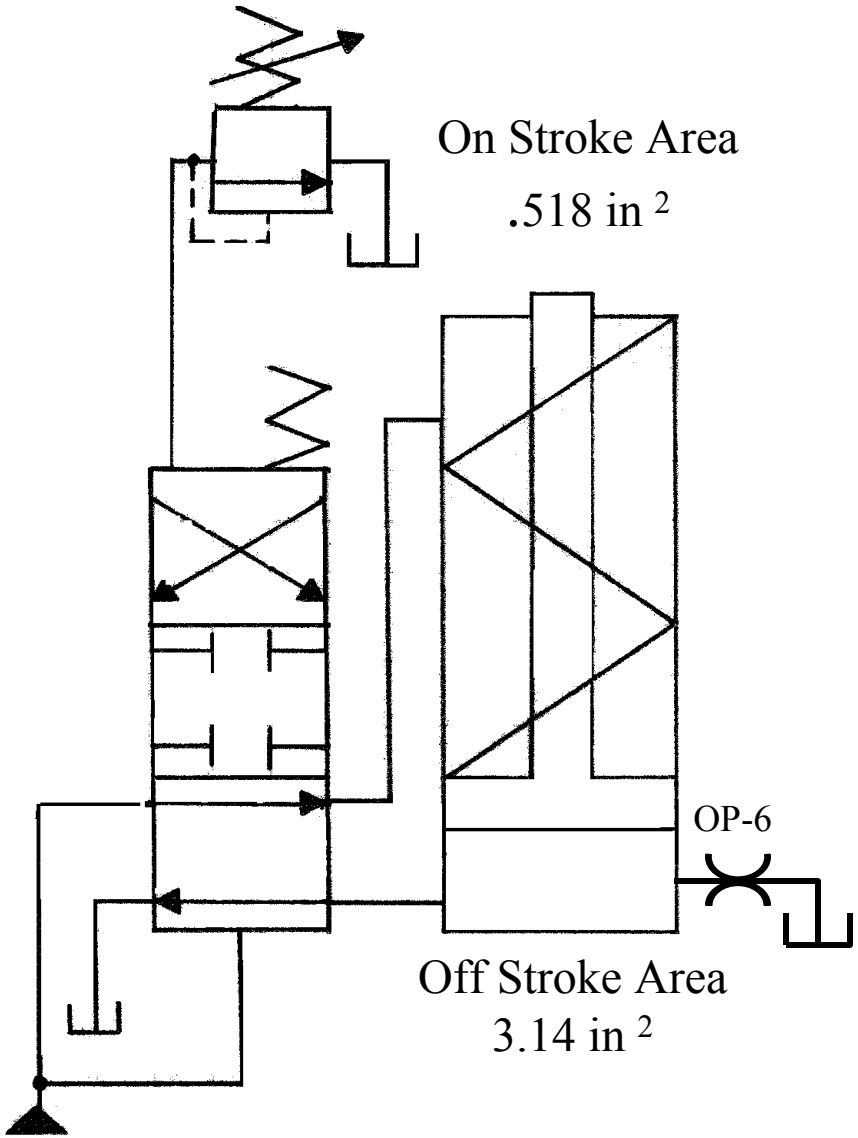
Case Slip Increases When Unit Strokes



PVG "C" Frame Stroke = .750"
On Stroke Response = 40 ms
Off Stroke Response = 50 ms
Amount of Flow Being Drained to Case
On Stroke = 15.16 GPM
Off Stroke = 2.018 GPM
Add in Pump Leakage
Full Stroke Leakage, On Stroke = 4 GPM
Compensated Leakage, Off Stroke = 7 GPM

Total amount of flow that must be accelerated through case drain line.

On Stroke = 19 GPM
Off Stroke = 9.018 GPM

Note: Calculations on this slide are for visual illustration purpose's only.

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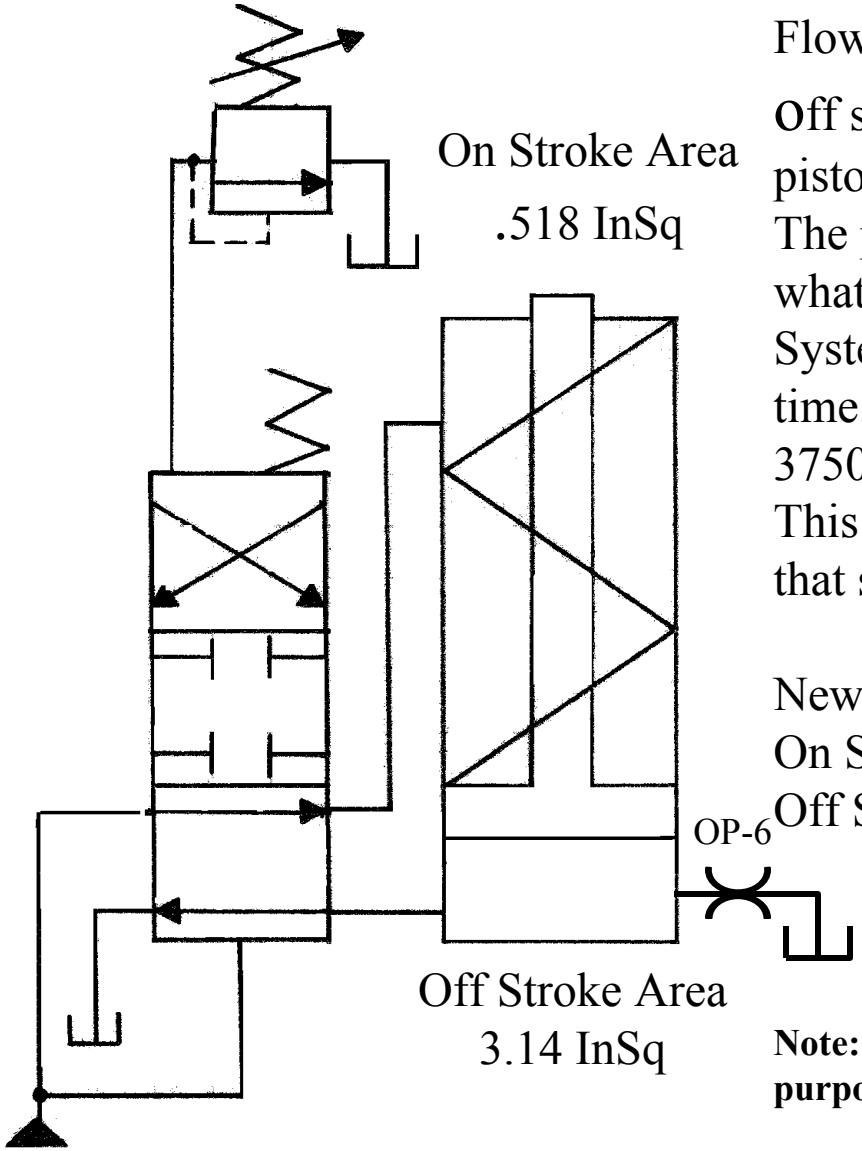
Case Slip Increases When Unit Strokes Continued



Flow across OP-6 must be added in when going Off stroke. When oil is ported to off stroke side of piston it also bleeds to tank through this orifice. The pressure on that side of the piston will go to whatever it needs to in order to move the piston. System pressure could be seen for a short period of time. Let's use 3750 psi -
3750 psi across .081" dia orifice = About 11 GPM. This flow is not added in when going on stroke as that side of the piston is open to tank.

New Totals
On Stroke = 19 GPM
Off Stoke = 20.018

20 GPM Has to be Accelerated Through Case Drain Line When Pump Shifts

Note: Calculations on this slide are for visual illustration purpose's only.

Case Spike While Pump Comes Off Stroke

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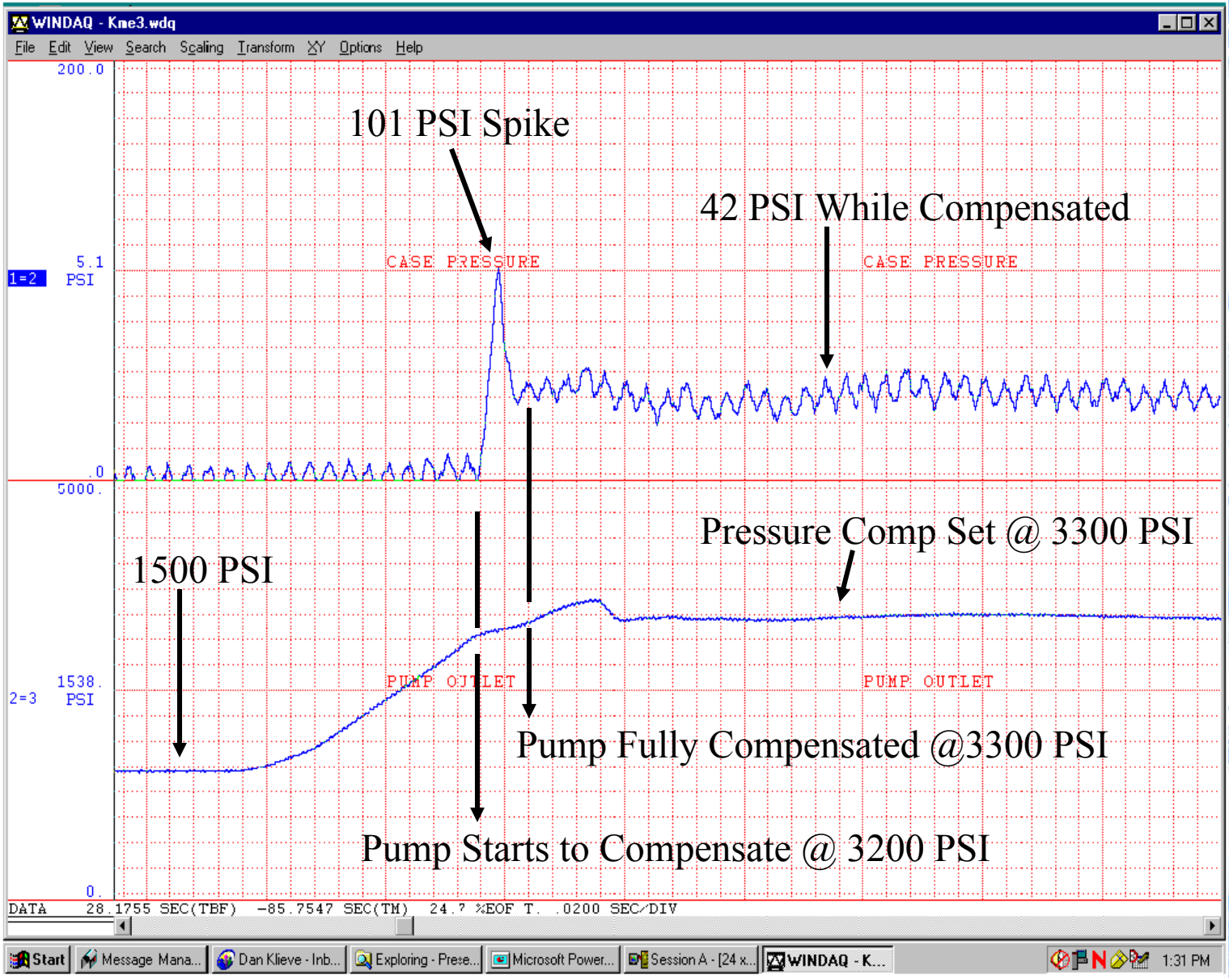

PVG -065 with 5/8” case drain - 20 feet long

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Effects of Case Pressure

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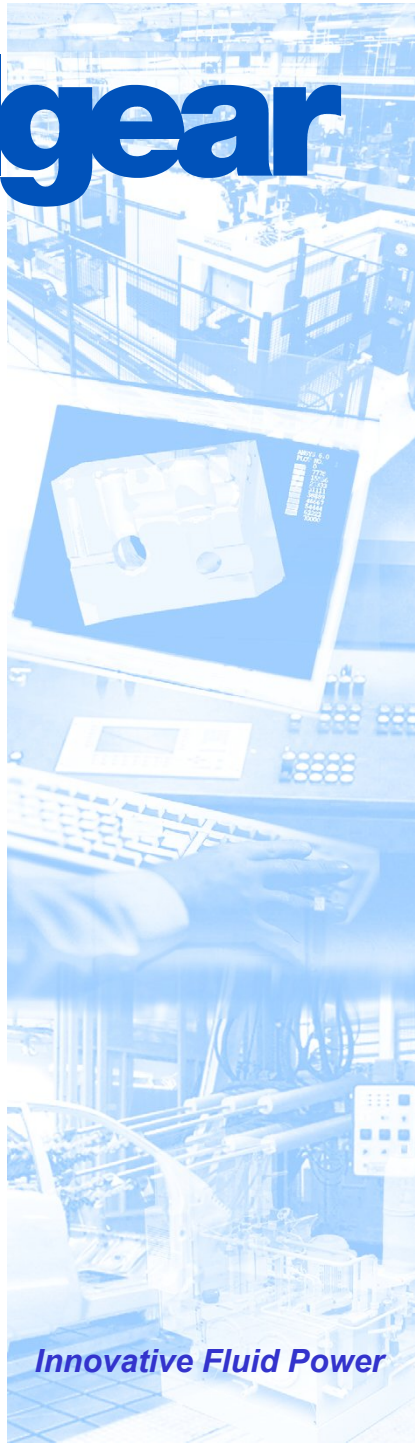
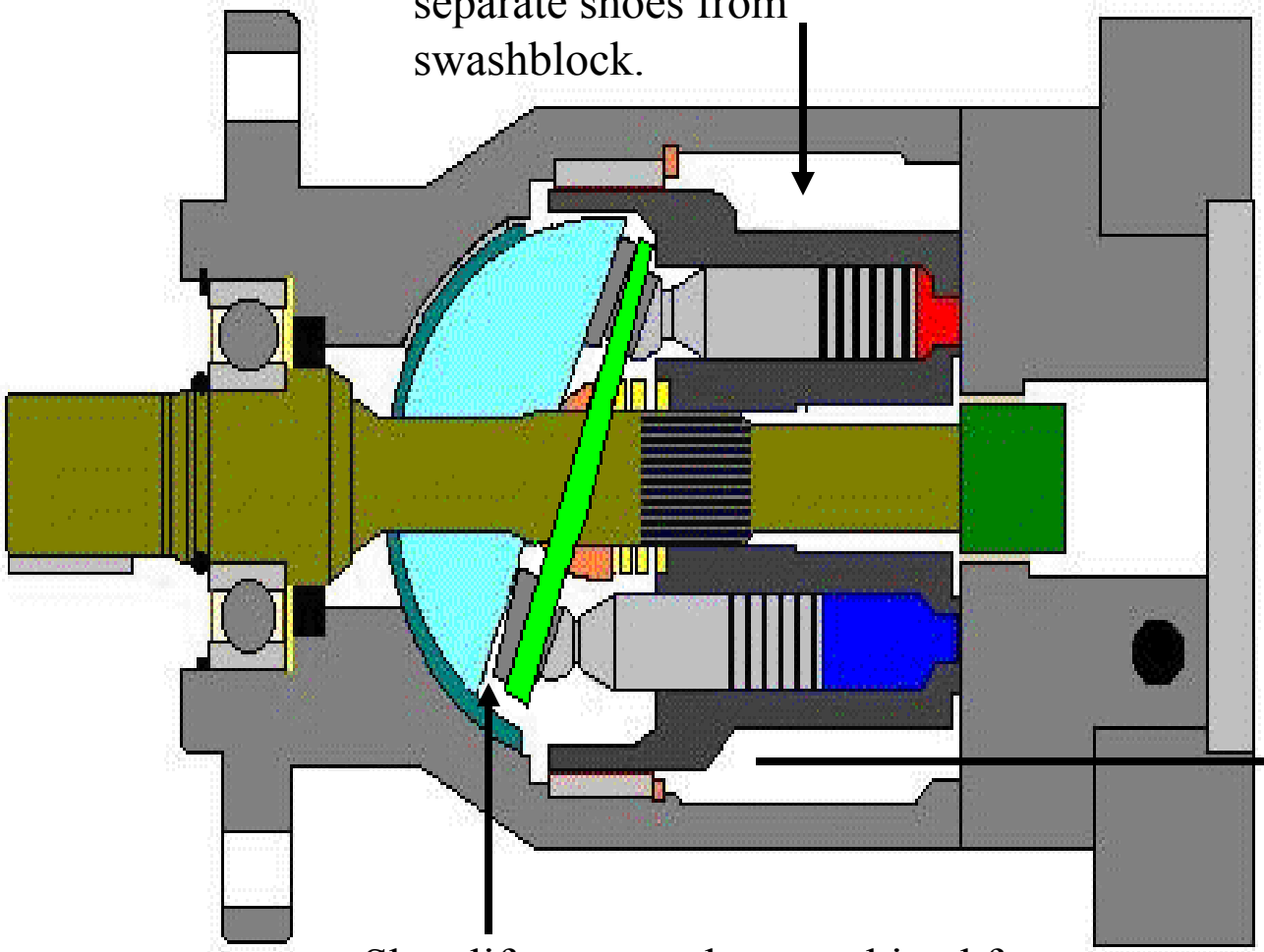
- Shaft Seal Failure
  - *Standard Seal Rated to 25 PSI
- Gasket Failures
- Piston Shoe Swashblock Failure
  - *Shoe Lift



Shoe Lift

Case pressure is an added force acting on shoe faces wanting to separate shoes from swashblock.



Force acting on piston wants to separate shoe from swashblock on suction side, force varies with rpm, stroke and inlet condition.

Shoe lift occurs when combined forces overcome fulcrum ball spring.

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Shoe Lift Occurs Due to Case to Inlet Differential Limits

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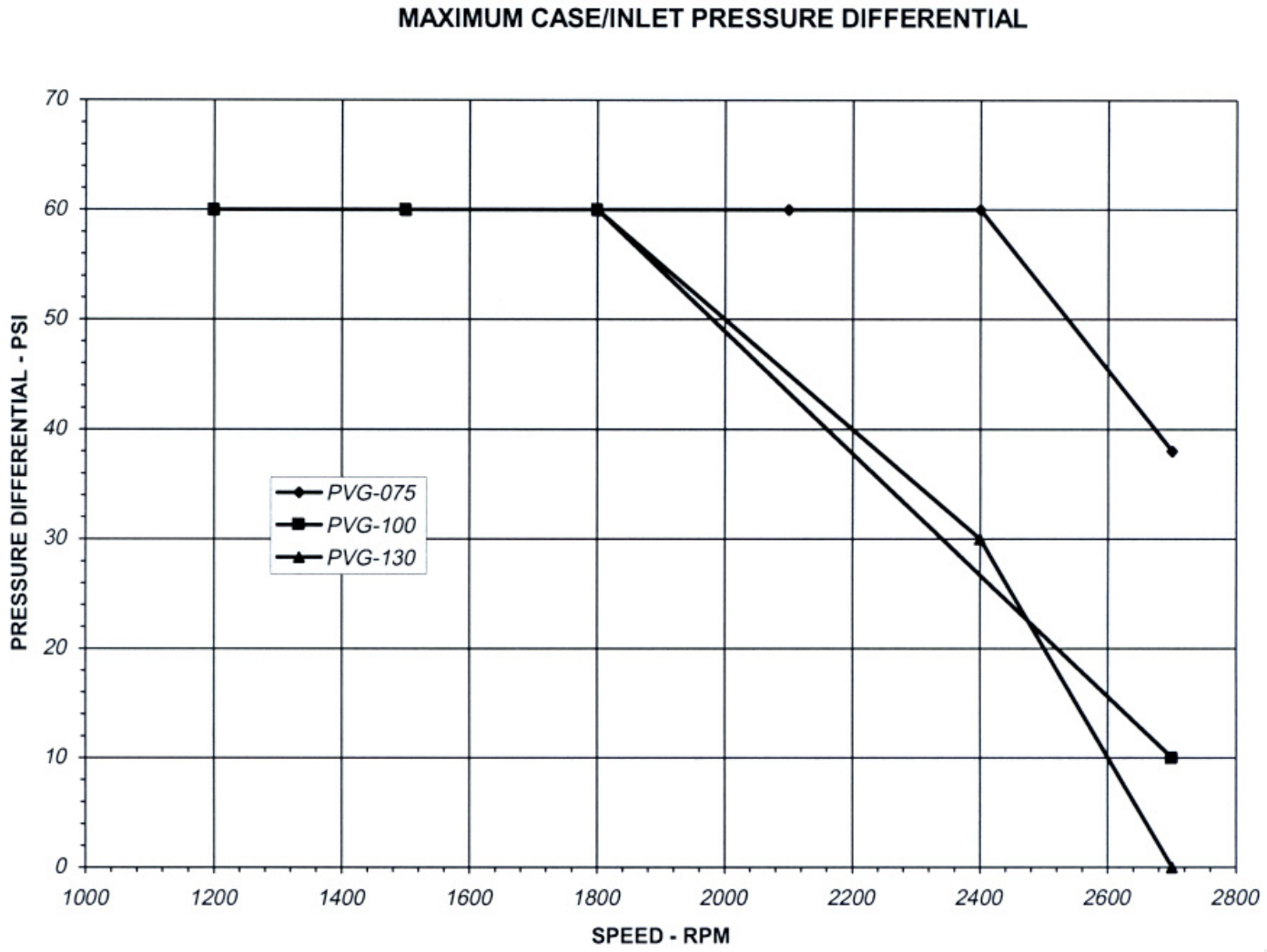
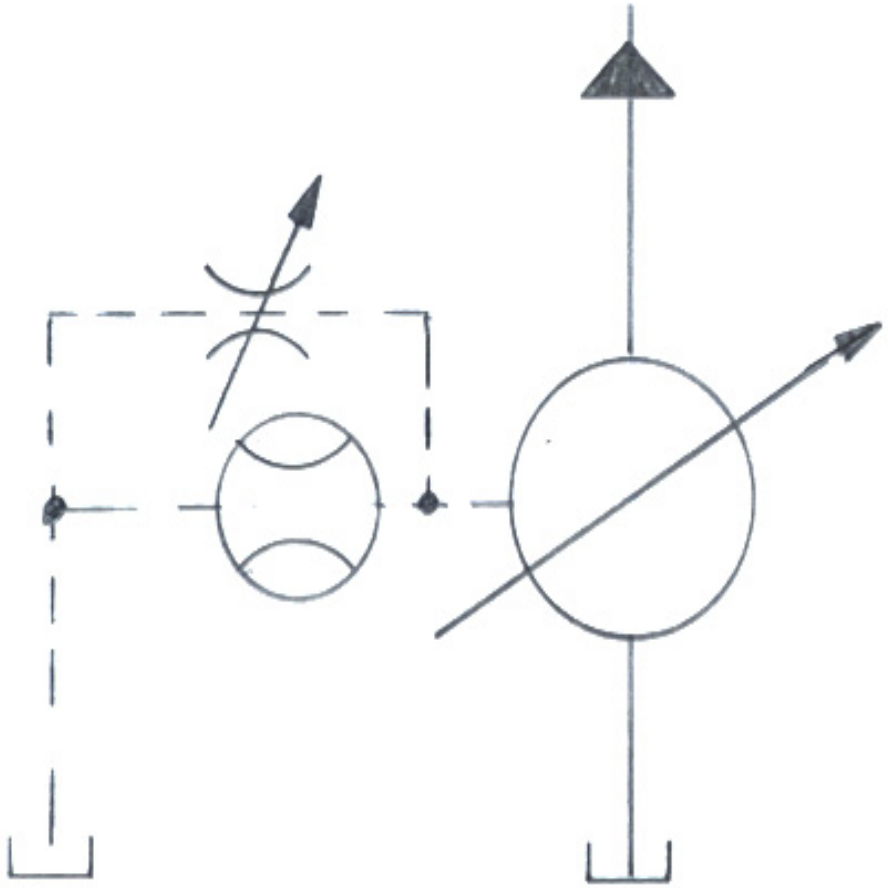


tive Fluid Power

Flow Meter in Case Drain Line Not Recommended, But if You Must



Put a full size ball valve in parallel with the meter. Ball valve should be **open** during **Normal Operation**. Close the valve to check case slip when needed. This does 2 things:

1) It Protects the Pump From Case Spikes.

2) It Saves Wear and Tear on the Meter When the Pump is Cycling

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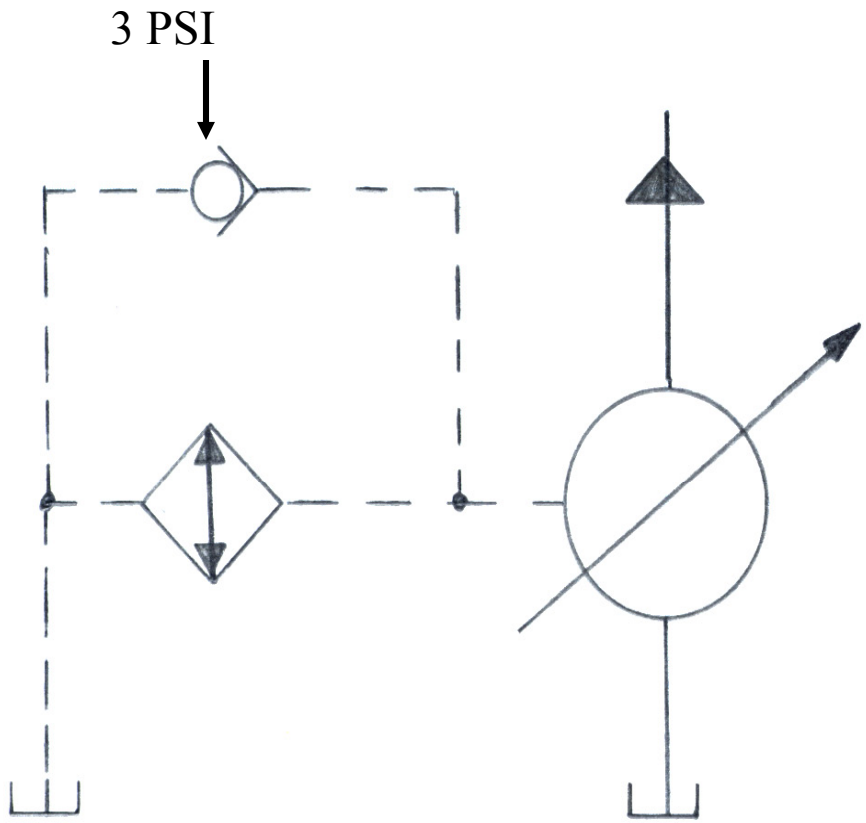
Cooler in Case Drain Line Not Recommended, But if You Must



Put a 3 PSI check valve in parallel with cooler to protect pump from case spikes.

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Inlet Conditions

- Inlet Lines Should be Full Size
- Inlet Lines Should be Unrestricted and as Short as Possible
- Inlet Lines Should Have a Minimum of Fittings and Elbows
- Inlet Location
    - *Away From Return Lines
    - *Proper Reservoir Baffling
- Suction Strainers are Not Recommended
    - *If Required Size for 3 Times Pump Volume

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Inlet Sizing on Variable Displacement Pumps is Critical

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PRESSURE REQUIRED @ PVG-130 INLET STEADY STATE

MIN. INLET REQUIRMENT 1800 RPM = 11 PSIA

LOSS THROUGH 2.5” PIPE WITH ONE ELBOW = APPROXIMATIVELY .3 PSI

PRESSURE @ THE INLET @ SEA LEVEL 14.4 PSIA

PRESSURE REQUIERED WHILE COMING ON STROKE @ 50 MS

SAME LOSS DUE TO PRESSURE DROP = .3 PSIA

ADDED LOSS DUE TO ACCELERATING THE COLUMN OF FLUID IN 50 MS = 2.46 PSIA

PRESSURE @ THE INLET WHILE PUMP COMES ON STROKE IN 50 MS @ SEA LEVEL = 11.9 PSIA

The above is under best of circumstances on oil. Even with that we are approaching the cavitation point of the pump. Many things contribute to inlet requirement, such as Fluid Type, Line Length, Any Inlet Restrictions, RPM, Elevation.

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Inlet Sizing on Variable Displacement Pumps is Critical

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IF THE HIGH RESPONSE TIME IS NOT REQUIRED YOU CAN MAKE THIS CONDITION BETTER

PVG-130 WITH RESPONSE SLOWED TO 200 MS

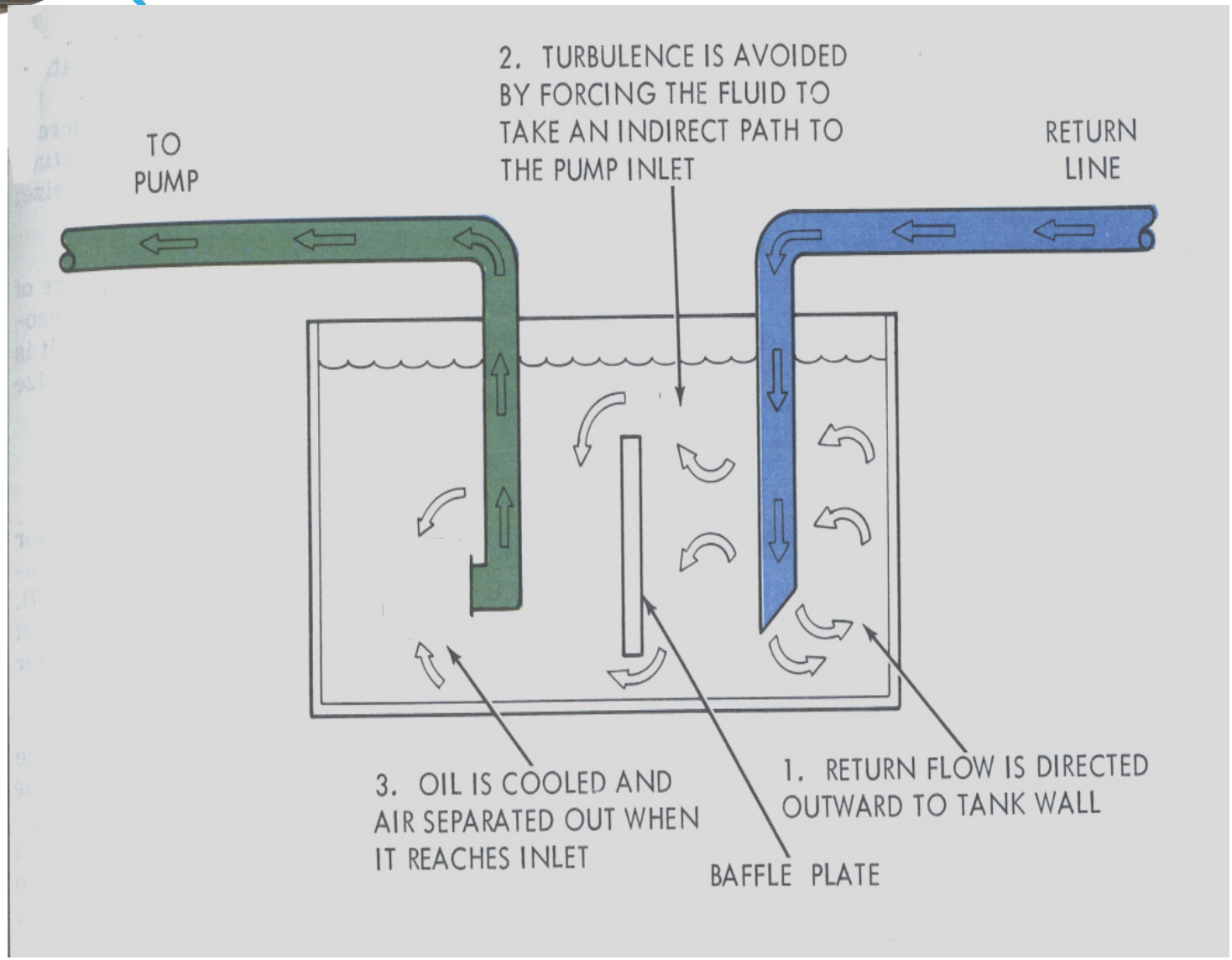
SAME LOSS DUE TO PRESSURE DROP = .3 PSIA

ADDED LOSS DUE TO ACCELERATING THE COLUMN OF FLUID IN 200 MS = .7 PSIA

PRESSURE @ INLET WHEN PUMP COMES ON STROKE IN 200 MS @ SEA LEVEL = 13.5 PSIA

This condition allows a little more room for other added losses such has Heavier Fluids, Longer Line Lengths, Higher RPM, Elevation.

Proper Reservoir Design



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Be Aware of Pump Inlet Characteristics

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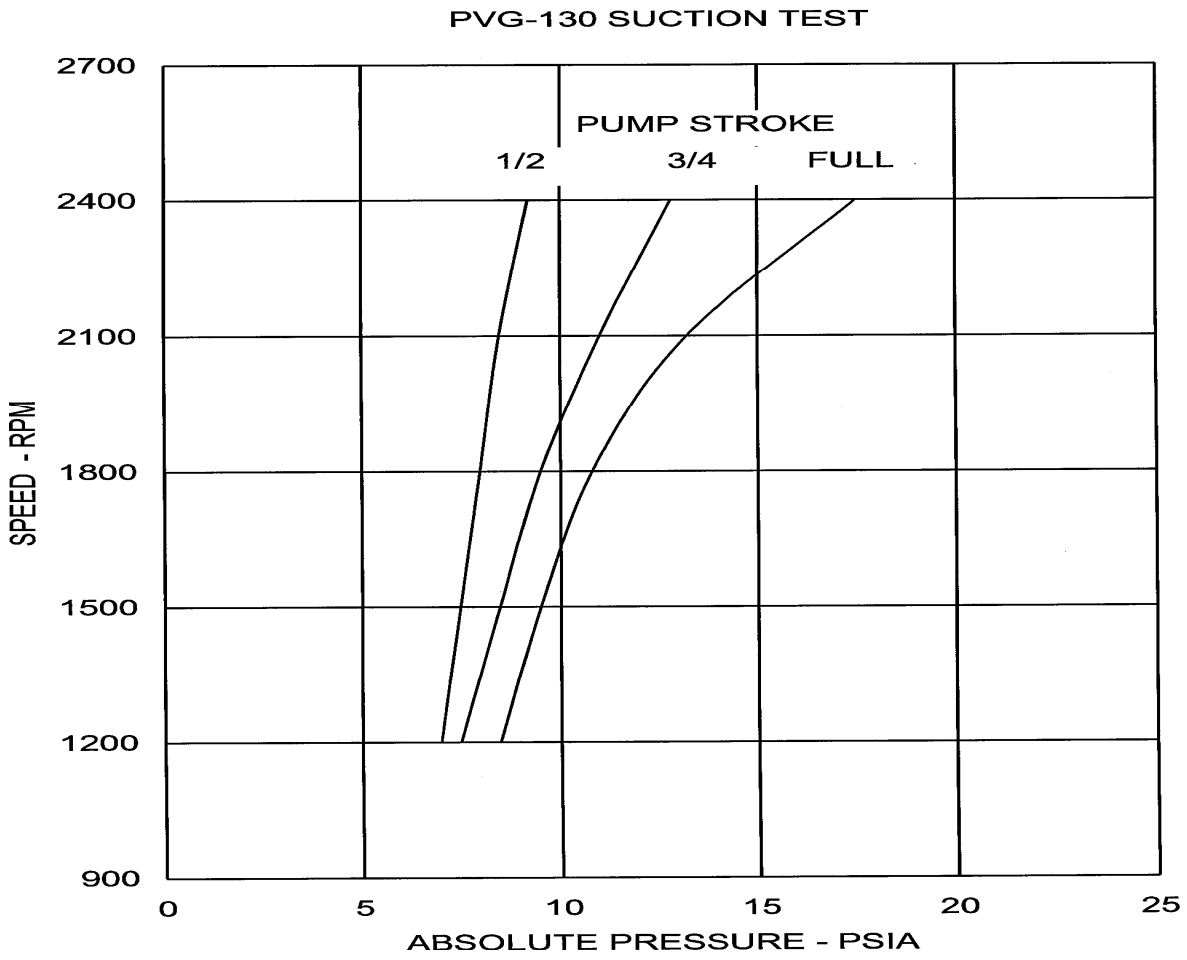

Fast Acting Relief

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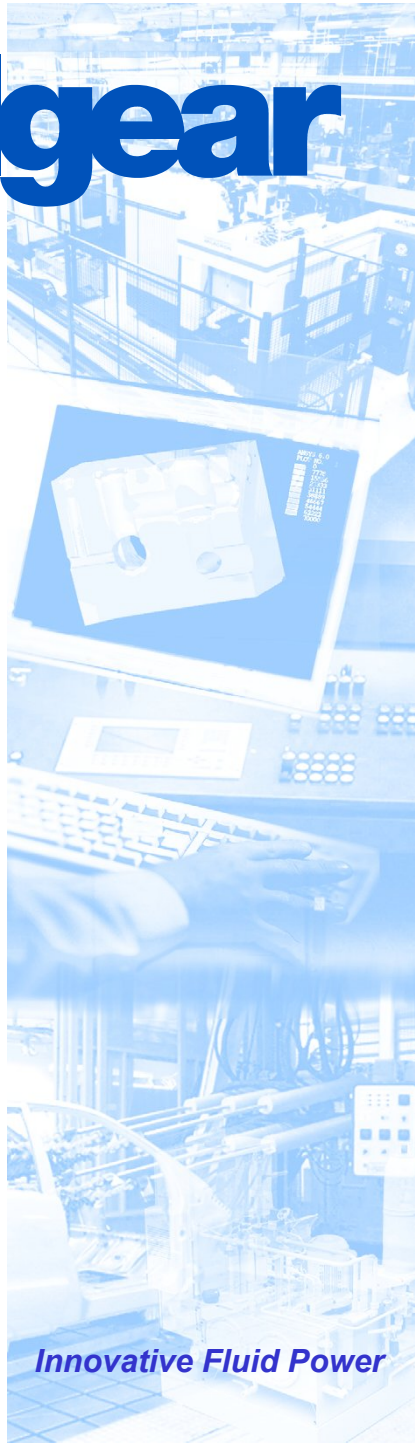
- Fast Acting Relief Always Recommended
- Pressure Compensators Not Meant to Act as System Relief

  *Flow is Still Being Delivered to the System While Pump is Coming Off Stroke
- Relief Should be Set 300 PSI Above Compensator Setting



Spike Generation
No Relief

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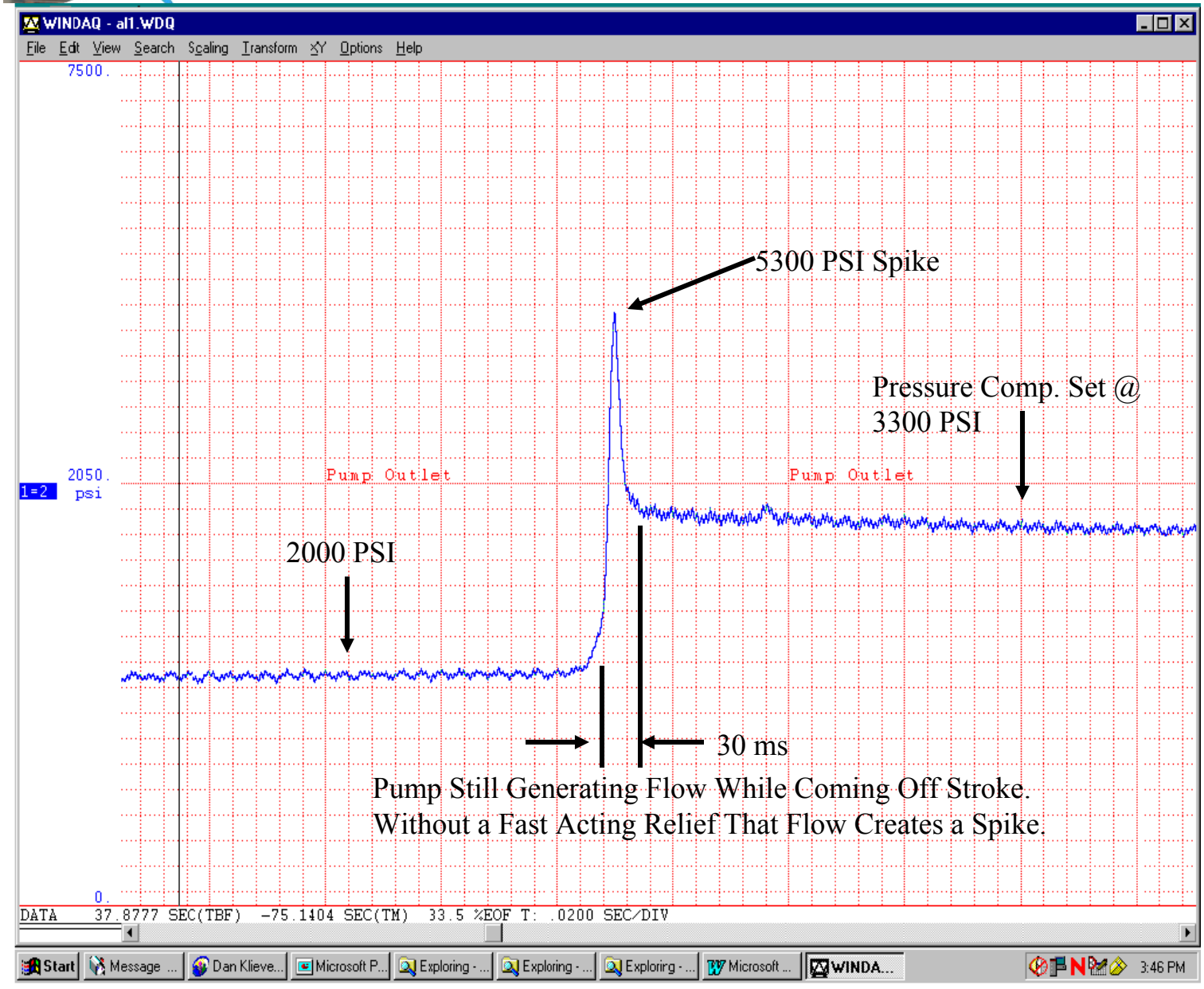

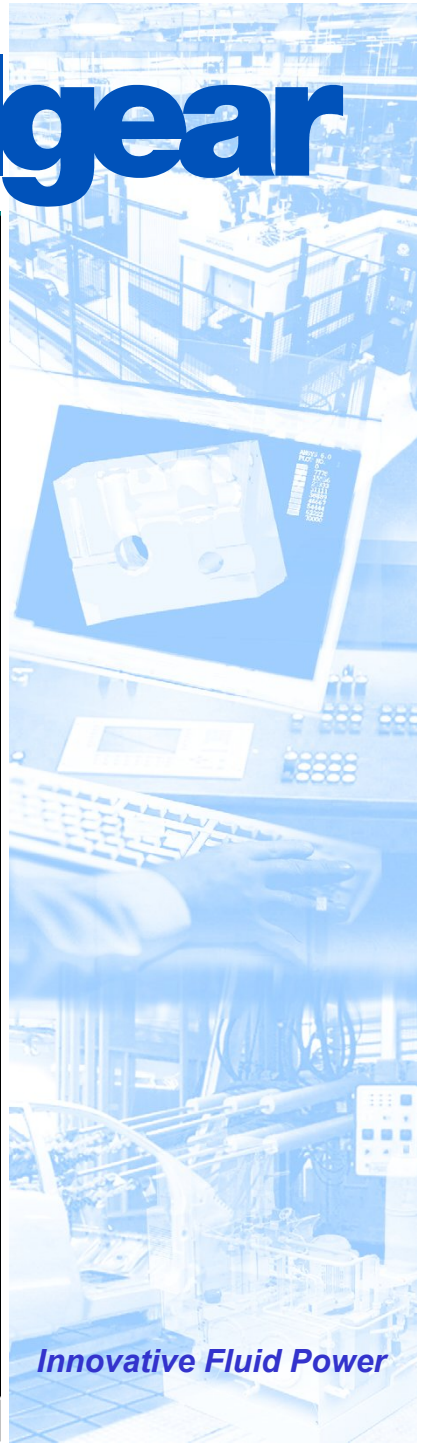

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Spike Generation With Relief

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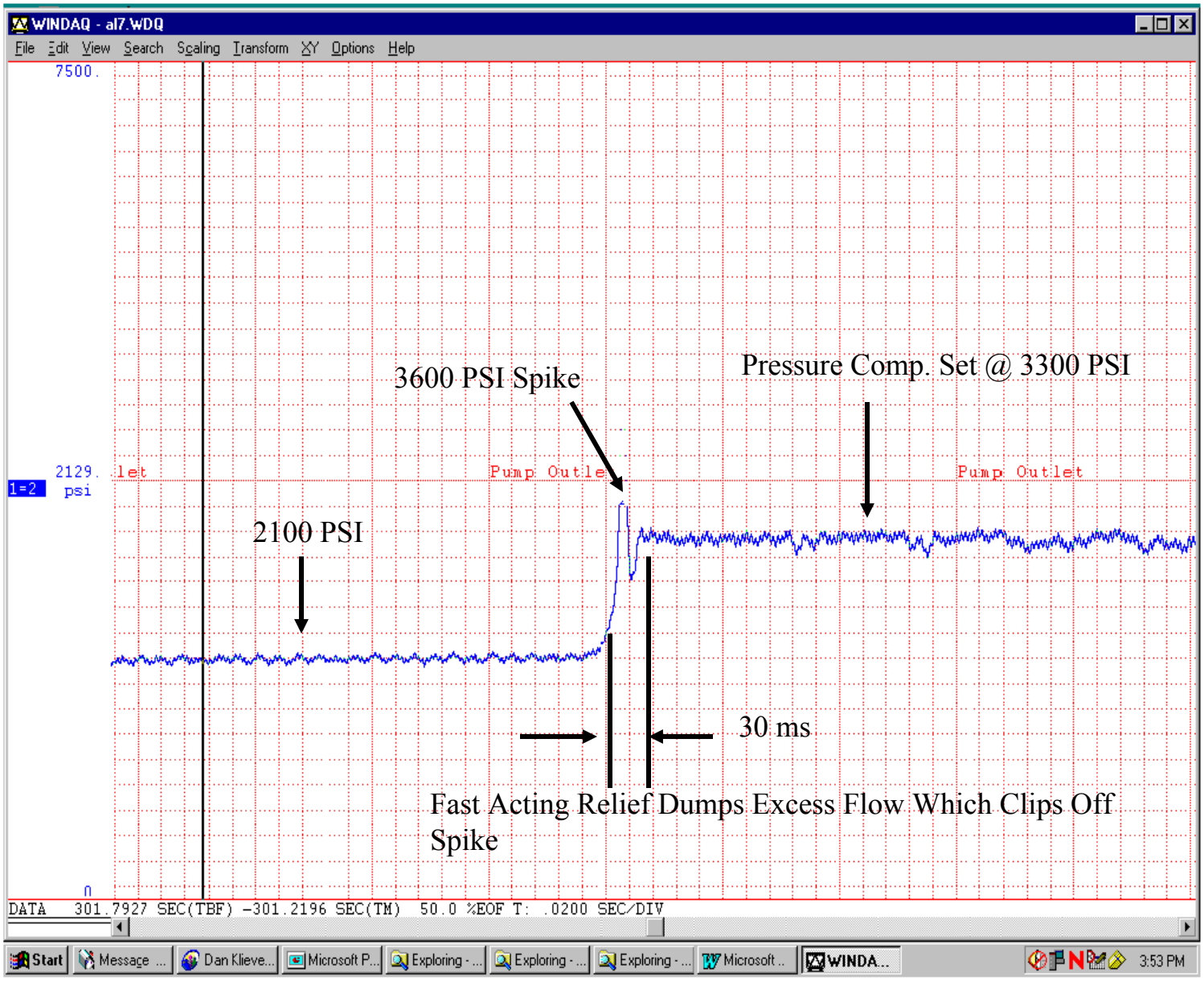

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Filtration

- Use Minimum 10 Micron Filters
- Use By-Pass Filters With Indicators
- Off Line Filtration Preferred
- Keep Fluid to Recommended ISO Level

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Start Up

- Make Sure Tank is Full of Fluid
- Make Sure All Shut off Valves are Open
- Fill Case Completely Before Operating
- Check for Proper Rotation

    *Rotation is Referenced Looking at Pump Shaft

- Provide a Means of Purging Air From Discharge Line
- Back Out Pressure Compensator and System Relief
- Jog Motor if Possible

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- Following the proper installation procedure directly relates to the success of the application and the life of the pump.

Thank-You

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