132 'Cardinal Sins' of Hydraulics

What **NOT** to do with hydraulic equipment!

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This list was compiled and edited from hundreds of submissions sent to me by readers of my *Inside Hydraulics* e-zine.

It is possible that not all of these 'Cardinal Sins' will ring true for you but nevertheless, they all have at least some merit when it comes to defining what ***not*** to do with hydraulic equipment.

Indeed, some are directed at operators, some are for designers, but most are for everyone involved in keeping hydraulic equipment running. And this list is by no means exhaustive!

You are encouraged to pass a copy along to anyone in your circle of influence, who might benefit from – or even enjoy reading it!

The 132 'Cardinal Sins' of Hydraulics:

1. Sizing pipe or tube based on thread size or outside diameter. Inside diameter is what counts!
2. Not acknowledging the importance of the tank breather as a contamination control device, and not giving it the attention it deserves.
3. Sizing piston pump or motor case-drain lines based on volumetric efficiency when new.
4. Not installing filter clogging indicators – or better still – differential pressure gauges.
5. Assuming new hydraulic oil is 'clean' hydraulic oil.
6. Changing the hydraulic oil on hours because the book said to.
7. 'Fiddling' with a hydraulic system that's not 'broken'.
8. Revving the engine to high idle when the oil is cold.
9. Continuing to operate an aerated hydraulic system.
10. Continuing to operate a cavitating hydraulic system – especially if it's a hydrostatic transmission.
11. Continuing to operate an overheated hydraulic system.
12. Replacing a component which has failed catastrophically without cleaning the tank and flushing the system.
13. Flushing the system without regard to possible accumulation of debris in the oil cooler.
14. Flushing the system without 'looping out' dirt sensitive components.
15. Continuing to operate cylinders with damaged rods or wiper seals.
16. Allowing dirt or debris to build up around the hydraulic tank and breather.

17. Standing underneath or working on a hydraulic machine when the load has not been mechanically supported….

(Photo credit unknown)

…even on a hot day when there's no shade around!

18. Not considering the possible presence of residual pressure before breaking into a hydraulic line.
19. Trying to measure hydraulic oil temperature 'by hand'. This is what an infrared thermometer is for!
20. Attempting to disconnect any hose or fitting that is under pressure.
21. Not wearing appropriate personal protective equipment when working on or around hydraulic equipment.
22. Allowing hydraulic cylinders to 'diesel' by not adequately bleeding during installation.
23. Increasing hydraulic system pressure settings without prior consultation with the machine manufacturer.
24. Not referring to the operator's or workshop manual when necessary (assuming you know it all).
25. Being lazy and not learning how to read and interpret hydraulic circuit diagrams.
26. Failing to properly document hydraulic system performance tests for evaluation and future reference.
27. Operating the machine overloaded for extended periods.
28. Forgetting or ignoring accepted safety protocols when carrying out service or repair work.
29. Condemning a hydraulic component as faulty without proving it through a logical process of elimination.
30. Disconnecting hydraulic lines to measure leakage – use a flowmeter instead!
31. Changing hydraulic oil without performing oil analysis.
32. Cranking up the pressure relief valve just because the system is sluggish.
33. Making any adjustments you are unsure of.
34. Installing a needle valve to control the speed of a system or sub-system – without regard to the heat-load it creates.
35. Failing to install drop-tubes on tank return and drain-line penetrations.
36. Installing a suction strainer or inlet filter – without an *exceptional* reason for doing so.
37. Making a hydraulic pump 'lift' its oil – flooded inlet is best.
38. Using quick couplers – unless they're absolutely essential.

39. Taking the operator's word for it when he says it's raining – without sticking YOUR head out the window to check.
40. Assuming a component is working without testing it first - when troubleshooting
41. Commissioning or re-commissioning a hydraulic system without a check list.
42. Specifying or using an elastomer in a hydraulic system without first verifying its chemical compatibility with the fluid being used.
43. Failing to include adequate pressure test points when the hydraulic system is built.
44. Checking for leaks by 'feel' with your hand.
45. Not ensuring all accumulators are completely discharged prior to commencing work on a system.
46. Commencing service or repair work without first locking and tagging the machine out of service.
47. Carrying out pressure adjustments without a pressure gauge.
48. Creating a restriction by using hydraulic fittings and hoses that are too small for the job.
49. Failing to install adequate air bleed points - particularly in brake circuits or large volume cylinders.
50. Starting a machine at anything other than low idle - to allow the oil to circulate before any components are loaded.
51. Believing a big heat exchanger is a substitute for a big reservoir – or that a big reservoir is a substitute for a heat exchanger!
52. Thinking a bi-directional gear motor's case drain port can handle a pressure of 5 bar continuously - even if the manual says it can (unless you enjoy changing shaft seals).
53. Using Automatic Transmission Fluid in a high-pressure, high-performance hydraulic system – ATF is formulated for a different job.
54. Adding oil to the hydraulic tank without passing it through a filter first.
55. Starting a piston pump or motor without filling the case with oil.
56. Assuming the filter element is correct - just because it fits.
57. Failing to properly and securely blank-off open connections when components are removed from a system for testing or repair.
58. Adjusting something if you don't know what it is (or does).
59. Using Teflon tape to seal taper-thread fittings.
60. Installing components or connections with taper threads - unless there is NO other alternative.
61. Being cheap on filtration.
62. Selecting and installing components that are field adjustable - when it's not necessary.
63. Believing it is necessary to pre-fill filter housings – air is the lesser of two evils in this case.
64. Starting a pump without ensuring its intake is full of oil.
65. Not using a desiccant breather – especially in high-humidity or marine environments.
66. Over tightening hydraulic filters.
67. Modifying a component (e.g. change pump rotation) but not changing the part number on the component's tag.

68. Modifying the hydraulic (or electrical) circuit but not updating the schematics to reflect the changes.
69. Breaking into a hydraulic circuit without thoroughly cleaning around the access point first.
70. Claiming to have cured a leak by simply tightening a joint - without at least cracking, loosening and retightening.
71. Using a taper-thread adaptor in a parallel-thread port.
72. Beginning the troubleshooting process without checking the obvious things first.
73. Not installing a direct-acting relief valve to protect a pressure compensated pump.
74. Believing piloted operated check valves are motion control valves – and that counterbalance valves are load holding valves.
75. Mixing different types of hydraulic oil.
76. Using hose and inserts from different manufacturers.
77. Connecting the drain from a pressure control valve to the return line – without a least considering the effect of back pressure on the function of the valve.
78. Using pipe or fittings not rated for hydraulic service.
79. Attempting to take an oil sample for analysis when you don't really know what you're doing.
80. Poor 'housekeeping' when it comes to the handling and storage of hydraulic oil
81. Pointing to 'low pressure' as the cause of slow system or actuator speed.
82. Attempting to increase system pressure by adjusting the relief valve when a pressure compensated pump is installed – or setting them too close together.
83. Allowing nuts, bolts, tools, rags or any other debris to enter the hydraulic tank.
84. Thinking that your current way of doing things is the best way.
85. Not paying due care and attention to hydraulic fluid cleanliness.
86. Applying silicone sealant to tank lids or o-rings.
87. Installing new o-rings inside dirty, damaged or corroded o-ring grooves.
88. Applying Teflon tape to flare or compression joints.
89. Placing any part of your body in the path of a hydraulic actuator.
90. Being in too much of a hurry.
91. Failing to verify equipment fluid requirements or knowingly using an incorrect fluid.
92. Not using diagnostic publications or other pertinent information when it's available.
93. Practicing diagnostics by consensus.
94. Not asking for or having the required help or equipment.
95. Jumping to conclusions when troubleshooting.
96. Failing to properly document past problems and their solutions, along with machine repair history.
97. Using compressed air to disassemble hydraulic components – especially cylinders.
98. Using an air hose to blow dirt off of your skin.

99. Not doing preventative maintenance.
100. Failing to take all pressure losses into account when sizing a system.
101. Not communicating equipment use guidelines or maintenance requirements to operators.
102. Using split washers on flange bolts.
103. Adjusting a relief valve without a gauge.
104. Fiddling with any adjustment screw – just to see what it does.
105. Not having a regular oil analysis program in place.
106. Believing a hydraulic pump creates pressure (resistance to pump flow creates pressure).
107. Measuring o-rings for replacement purposes (it's the grooves you should be measuring).
108. Not using pressure gauge isolators - to protect the instrument.
109. Installing a flow control to reduce pump flow – without considering the heat-load it creates.
110. Using cheap reservoir filler/breathers (or worse, using no breather filter at all).
111. Using steel piston-rings as the dynamic seal in a steel cylinder barrel.
112. Using an inline flow-tester to measure case drain flows.
113. Fitting isolator valves to pump intakes – without installing proximity switches and interlocks to prevent pump operation when closed.
114. Fitting a blocking valve to the pump outlet (before the relief valve).
115. Using elbow fittings when the job can be done with a bend.
116. Connecting piston pump or motor case drains to the return line.
117. Connecting the drain from a spring-applied brake to the return line.
118. Manufacturing a hydraulic tank without a drain plug or putting it in a place where it can't be used.
119. Making hoses and leaving the ends open.
120. Pressurizing the piston side of a single rod cylinder with the rod side blocked.
121. Allowing a hydraulic hose to twist when it's being tightened.
122. Tolerating 'slow' oil leaks.
123. Using a long 'cheeta' pipe to over torque fittings.
124. Believing what the operator says is the problem without checking it out for yourself.
125. Trying to fix something when you don't know or understand how it's supposed to work in the first place.
126. Connecting quick couplers without cleaning both the male and female halves.
127. Using suction and return hose not designed for oil service.
128. Installing a new hydraulic line without checking for and removing contaminants
129. Not internally cleaning the hydraulic tank periodically.
130. Removing a valve (or any other component) for re-sealing without eliminating its connections or conductors as the source of the leak first.
131. Being 'cheap' with hydraulic oil.
132. Not taking the time to *really* understand how hydraulics work.

If you could use a little help with #132,
check out the resources at: www.HydraulicSupermarket.com