APPLICATION NOTE

Five mistakes in hydraulic maintenance that even experienced technicians make

What to look for and how to improve hydraulic asset uptime Hydraulic maintenance is critical to the uptime of your plant. Troubleshooting hydraulic equipment requires getting the right information quickly and easily, every time. Here are 5 simple mistakes to look out for when troubleshooting critical and semi-critical hydraulic equipment.

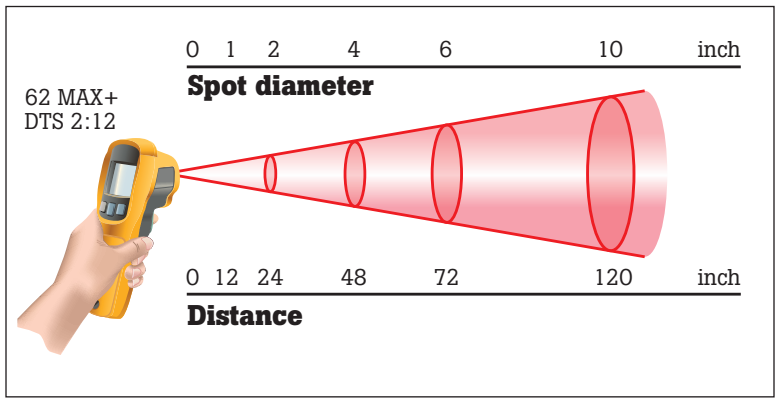
MISTAKE #1: Relying on a misleading temperature value

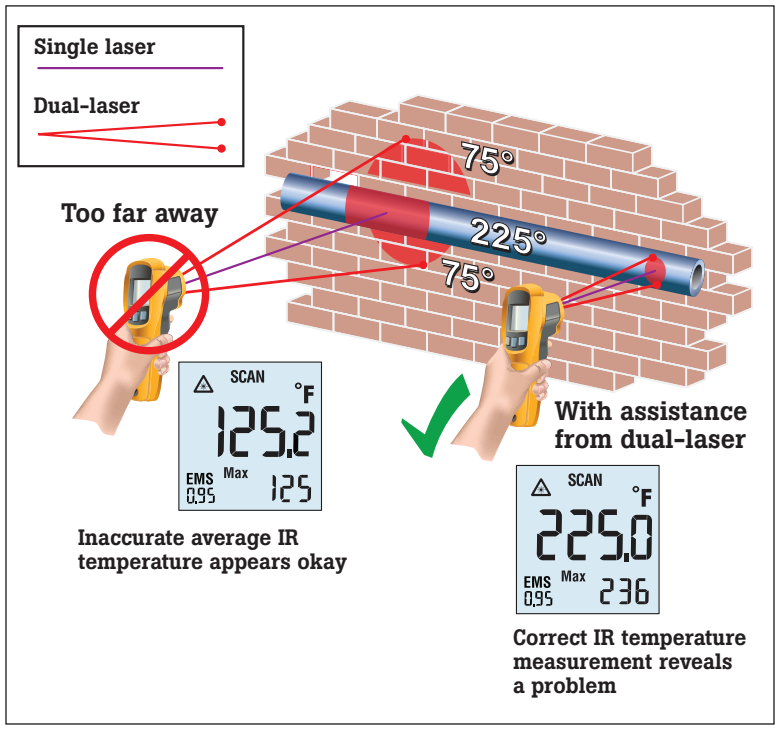
High temperature zones—hot spots—are one of the best indicators of something going wrong in a hydraulic system. If you know the normal operating temperature, then you can regularly check for any changes, using an infrared (IR) thermometer. However, it's easy to get a misleading measurement from an infrared thermometer, and if you're not getting an accurate reading then you don't have the right information to make decisions about the health of your hydraulic equipment.

For anyone who uses an infrared thermometer, understanding the thermometer's "measurement spot" is key to getting accurate measurements on thin elements, such as hydraulic lines and hoses.

Many non-contact infrared thermometers include a laser pointer for aiming the measuring tool. That laser is not what actually takes the measurement. Infrared thermometers measure the average temperature radiated from a surface region. That surface region gets larger as you move farther away from the target. Most infrared thermometers aim a single laser at the center of this "invisible cone-shaped" IR region.

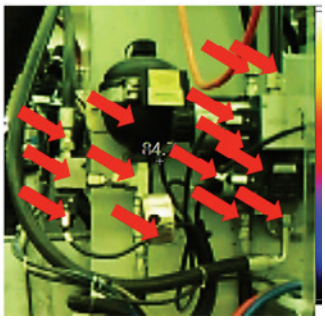
The formal name for this cone effect is "distance to spot ratio." If your thermometer has a 10:1 distance to spot ratio, and you are 10 inches away from your target, your thermometer will measure the average temperature of that entire one-inch circle. If you are 10 feet away, your measurement spot will be a one-foot circle. That becomes critical when measuring small elements, such as hydraulic hoses or valves. To help clarify the measurement zone, the Fluke 62 MAX+ uses dual lasers to show the outside of the circle that defines the measurement spot. In other words, with the 62 MAX+, the spot lies between the dots. The following picture illustrates what a bad measurement looks like (left) and how the Fluke 62 Max+ helps you to avoid this mistake (right).





Use the dual lasers on the Fluke 62Max+ to make sure the size of the area you are measuring (between the lasers) is limited to the target object.

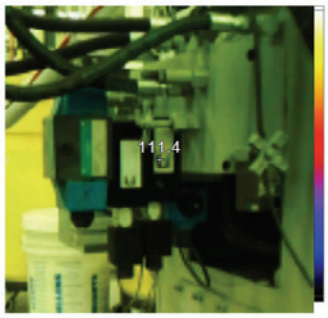
With an IR spot thermometer:

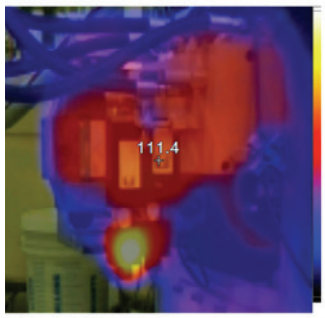


Up to 14 individual measurements with an IR spot thermomter...did you miss a spot?

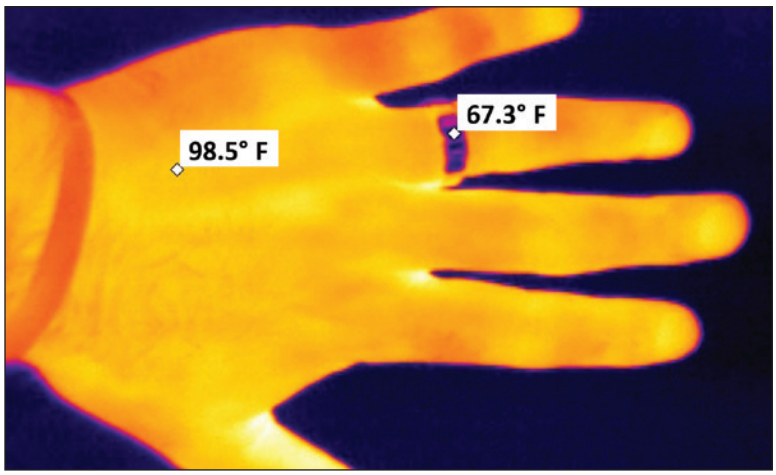
With a simple visual IR thermometer:

Instant identification of hot spots with full context. Even reveals hot spots in unexpected places.





Visual inspection saves time and is more intuitive than individual numeric temperature readings. With a visual thermometer, you can detect problems at a glance and make one continuous scan over an entire system



Different emissivity between human skin and a gold ring results in an inaccurate temperature measurement of the ring.

When taking infrared temperature measurements:

1. Know your target's emissivity
2. Do not measure on bare, smooth metals (emissivity < 0.6)
3. et the emissivity on your measurement equipment

MISTAKE #2:
Missing the critical measurement

When important equipment is down, every minute matters. Individually checking the relative temperature of every component in a hydraulic system is a time-tested method for identifying failed components, but it takes time. A "visual thermometer" is a different kind of thermometer that combines multiple individual infrared readings and overlays them onto a visual image, making it faster and easier to find hot spots on hydraulic equipment and reducing the chance that you'll miss a critical detail. Visual thermometers are much less expensive than infrared cameras and are simple to operate. One composite image is worth thousands of spot measurements.

MISTAKE #3:
Measuring shiny steel pipes

On hydraulics, many times we need to take infrared temperature measurements on steel pipes or bare surfaces, which usually have a shiny finish. The problem is that infrared can't take an accurate measurement of a shiny metal surface.

There's something called "emissivity" that tracks on a scale from 0 to 1 how efficiently a material can radiate infrared energy. Emissivity affects how accurately infrared can "tell" the temperature of those materials.

Most shiny metals have a very poor emissivity. For example, shiny aluminum has an emissivity of 0.1 (as a reference, human skin emissivity is 0.98). Any infrared measurement on an object with an emissivity below 0.60 is not accurate enough to rely on.

Bare, shiny, or polished metals do not provide accurate infrared measurements. This is especially true for fittings, valve bodies, and polished hydraulic piston rods. If you must take a temperature measurement on one of these components, apply matt tape or paint to the surface before measuring, and then focus your infrared tool on the matt area.

To reach optimum accuracy, best practices include knowing the emissivity of material and entering that value into the device taking the measurements. Most Infrared cameras and every Fluke infrared and visual thermometer allow you to adjust the emissivity setting, and some include a selection list of different common materials.

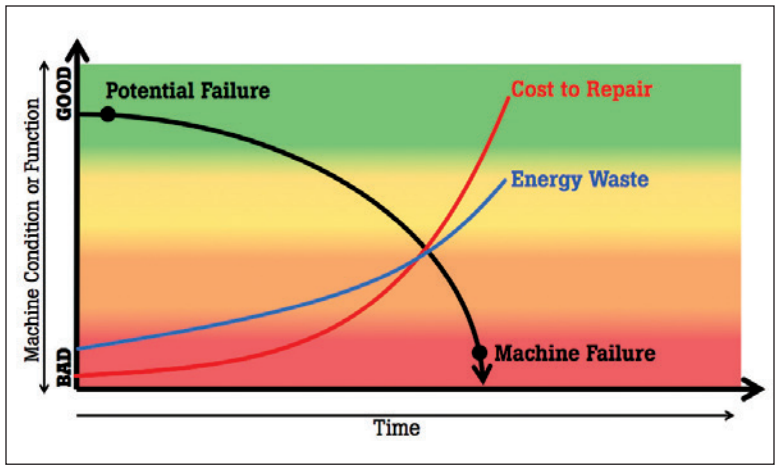
MISTAKE #4:
Missing key warning signs

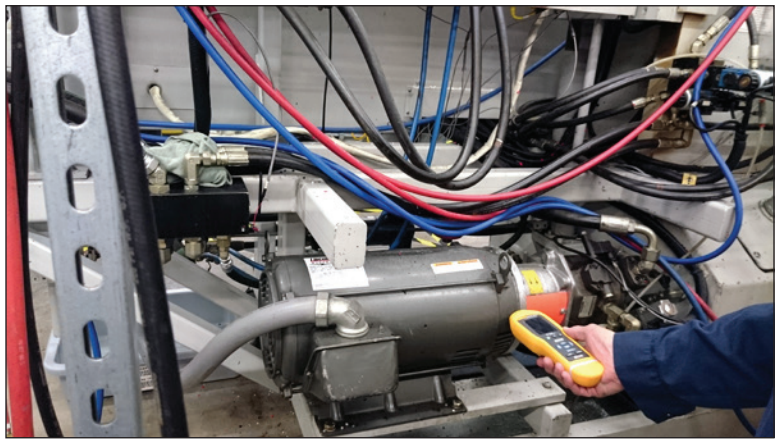
Rotating machinery such as hydraulic pumps and the electric drive motor coupled to it can show warning signs of pending failure long before it actually fails. As a machine's performance deteriorates, its energy consumption increases. The average cost of repairs also increases as machine performance deteriorates.

Knowing the condition of the machine in advance allows maintenance teams to make simple preventive repairs or else schedule maintenance and overhauls well in advance, during non-production hours or during scheduled down-time periods.

Vibration testing remains one of the best technologies for monitoring rotating machinery such as hydraulic pumps. The Fluke 805 Vibration Meter is a fast and simple way for front-line technicians to accurately assess the overall health of their rotating equipment. The 805 has a built-in pressure sensor behind the vibration tip to ensure that measurements are accurate and consistent every time – ideal for comparison and trending – and it has a built-in database of condition severity baselines for 37 different categories of rotating machinery.

The Fluke 810 Vibration Tester is a fully automated diagnostic tool that can analyze the vibration in rotating equipment and deliver specific diagnoses for each of the common faults present in a given machine. It also includes a severity rating and actionable recommendations for corrective actions. The Fluke 810 helps you diagnose faults and correct them early, so they don't become unplanned downtime later.





With the Fluke 805 Vibration Meter, know within seconds if the machine is good or bad.

With the Fluke 810 Vibration Tester, know within a few minutes, the specific fault diagnosis, severity, and repair recommendations.

MISTAKE #5:
Replacing parts without fixing root cause

The four most common causes of failure in rotating machinery, including hydraulic pumps, are:

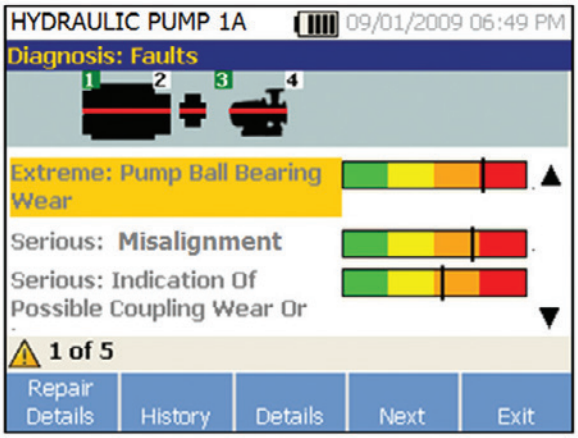
1. Misalignment
2. Imbalance
3. Looseness
4. Bearing wear

Bearing and seal wear are typically caused by the first three faults (listed above). It doesn't help to replace a failed motor by simply coupling a new motor onto the pump while leaving the underlying misalignment unresolved. Even slight misalignment across the coupling can lead to harmful forces in your hydraulic pump. And if bearings or seals keep failing, it won't help to just replace the parts unless you correct what is damaging the bearings in the first place. Companies can lose thousands of dollars per year in replacement bearings and hours of unnecessary repair time, not to mentioned shortened overall machine life.

The Fluke 810 vibration tester is pre-programed to diagnose these top four problems and make recommendations for corrective action. In most plants, 90% of the machines are standard motors, pumps, fans, compressors, and blowers – equipment with few variables. The Fluke 810 uses proven automated diagnostic software based on 30 years of machine baselines developed by vibration experts.

In the specific case of misalignment, laser shaft alignment is both the quickest and the most precise way to ensure that a pump and drive motor are properly aligned. Fifty percent of mechanical machine faults come from misalignment and most technicians simply ignore it. Don't feed bearings, seals and excess energy into your pumps: use a laser alignment tool such as the Fluke 830.

The Fluke 830 is an easy-to-use tool designed specifically for precision shaft alignment. It doesn't require extensive alignment education.



With the 810 Vibration Tester, all of the faults within a rotating machine are found and listed on the report. Replacing the bearings without fixing the root cause (misalignment, imbalance, looseness, etc.) will only result in replacing bearings again and again, year after year.

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