



BENEFITS OF ALIGNMENT



FixturLaser

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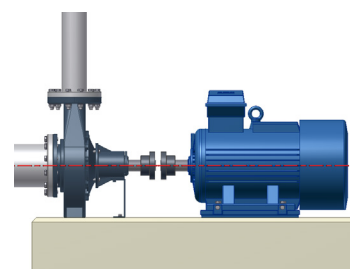
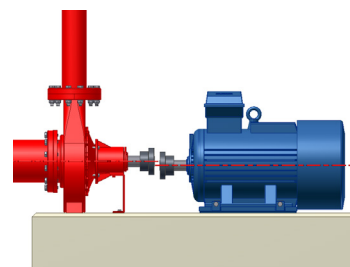
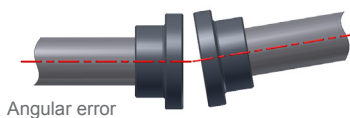
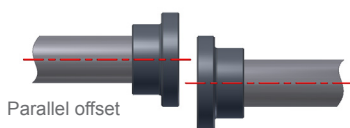
Benefits of Alignment

Alignment of machines has been performed for over 200 years.

The reasons have not always been obvious, but in the modern world the necessity of alignment is common knowledge. With today's optimized machinery, alignment is a vital part in the daily maintenance work. Machines need to be online continuously with a minimum of interruptions.

A machine breakdown causes devastating loss of production. Nearly 50% of all machine breakdowns are caused by misalignment.

Shaft alignment can be performed with different tools. The easiest way is to use a ruler or a straight edge over the two coupling halves and align by eyesight. The result is not very accurate and it is very operator dependent. A better result can be achieved by the use of mechanical dial indicators. A skilled and experienced operator can obtain good and reliable measurements, but it takes time and patience. A far easier and highly accurate way is to use laser based alignment systems. They do not require special skills and deliver accurate and reliable results.



Definition of misalignment

Misalignment is the deviation of relative shaft position from collinear axis of rotation when equipment is running at normal operating conditions.

How is misalignment recognized?

There are several symptoms indicating misalignment. By keeping your eyes open you can find them without any special equipment.

- Premature bearing, seal, shaft and coupling failure
- Excessive radial and axial vibrations
- High casing temperature at or near the bearings or high discharge oil temperature
- Excessive amount of oil leakage at the bearing seals
- The coupling is hot while it is running and immediately after unit shutdown. Look for rubber powder inside the coupling shroud
- Loose foundation bolts
- Loose or broken coupling bolts
- Excessive amount of grease on the inside of coupling guard
- Similar pieces of equipment are vibrating less or seem to have longer operating life
- The shafts are breaking (or cracking) at or close to the inboard bearings or coupling hubs

Effects of base conditions and thermal variations

Even if you align your machines properly there is a risk that they break due to misalignment. If the foundation where the machine is mounted is warped you may have a soft foot condition, i.e. one of the machine feet has a poor contact with the floor. It is of major importance that this is corrected before performing the alignment.

If the alignment is performed when the machines are cold, and no compensation for thermal growth is considered, the machines will probably be running severely misaligned at running temperature.

Differences in temperature can cause severe misalignment due to the fact that machine casings and pipes expand with raised or lowered temperature.

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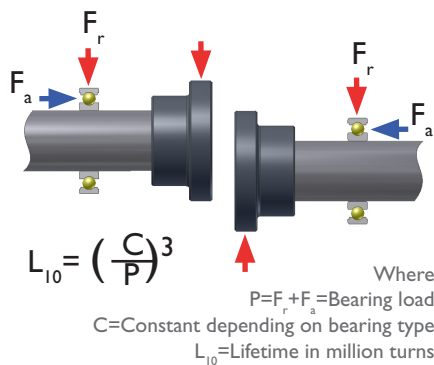
Aligning your shafts mean...

- Increased operating time • Increased productivity • Increased production quality



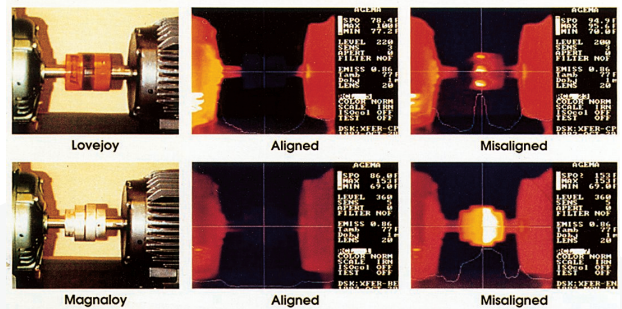
Misalignment and power consumption

Misalignment has a direct impact on the power consumption. Documented cases have shown savings ranging from 2 to 17%. The thermogram below shows two different couplings and the amount of heat generated due to misalignment.



Misalignment effects on bearings and seals

The bearings operating life span is directly affected by the forces it is exposed to. The slightest misalignment can generate excessive forces to the bearings and seals. A misaligned machine causes stress to both bearings and shafts. As an effect of this the seals open up, allowing lubrication leakage and contamination to enter. All together the bearings lifetime is dramatically shortened.



Benefits of Alignment – Customer references

GEORGE A. CAIN, MAINTENANCE ENGINEER, SOLVAY ADVANCED POLYMERS, USA

"We have gone over to laser-based alignment systems for alignment of all rotating shafts in pumps and motors. This is primarily due to the fact that laser-based systems are easier to use, most noticeably when it comes to documentation and storage of measurement data. This makes it easier for me to check that the company's machines are correctly aligned. Previously, we had to replace seals every three months, now it's only every second year, so going over to laser-based alignment has paid for itself several times over."

THOMAS MELBY, OPERATIONS TECHNICIAN, STATOIL TJELDBERGODDEN, NORWAY

"Here at Statoil we have had extremely good use of Fixturlaser's system for machine alignment. This is reflected in the excellent maintenance economy and availability of our plant – an incredible 99 % this year. We believe that Fixturlaser provides one of the best laser-based alignment systems, with good, reliable service which is important for us."

JOUNI WALLIN, SUPERVISOR MAINTENANCE TEAM, NYMÖLLA MILL, STORA ENSO, SWEDEN

"Before we started to use laser based shaft alignment, we had major problems with the wearing of the coupling's flexible elements due to misalignment between the pump and the engine. Nowadays, we rarely have any problems; they are subject to very few replacements. We also perform laser based alignment of our belt drives, which had to be replaced often due to wearing. We now have much less wearing of the belts, and hence less maintenance of these machines, as well as lower costs."



ALIGNMENT INTELLIGENCE

- 2nd Generation Digital Sensor
- All Digital System
- Unparalleled Signal Control

GRASP

GRAPHIC WORK FLOW

- Icon Based – Adaptive User Interface
- Color Touch Screen
- Screen Flip

TPS

TRUE POSITION SENSING

- Live Values during Adjustment
- VertiZontal Moves = Measure Once, Move in Two Directions
- Both Shaft Positions Monitored Simultaneously

Frequently Asked Questions

Where can I expect to find alignment problems?

Wherever you have rotating shafts there is a need for alignment. The higher speed the more accurate alignment is required. If an application is generating vibrations, you should always check the alignment.

Do misaligned machines consume more power?

Misaligned machines generate forces to the bearings and the coupling. This force is converted into heat and can easily be recognized using a thermo sensitive camera.

Do I need to align when I use flexible couplings?

Flexible couplings are necessary. They reduce the detrimental forces, due to misalignment, during the start up until the machines have reached the operating temperature. A flexible coupling can only absorb a very small amount of misalignment. Even then the components are exposed to stress and wear quicker. It is therefore important to align the machines for running conditions and not cold conditions.

I have new machines, do I really need to care about alignment?

A machine, such as motor and pump, is often delivered on a frame or base plate. Plug and play, sort of! Even if the machine is perfectly aligned from the supplier it does not mean it is perfectly aligned when bolted down and connected to the pipes in your factory. Always check the alignment before starting the new machine.

Why can't I refit the overhauled machine in the same position as it was before without doing an alignment check?

Even if you mark up the position before you remove the machine you can not know if it will be positioned correctly. The alignment requirements for a standard motor/pump installation is 0,08 mm/m or better. It is impossible to replace a machine within that tolerance without performing an alignment.

Our most effective shaft alignment tools

Fixturlaser NXA Pro

Fixturlaser NXA Pro is a complete shaft alignment tool

- **Wireless: Bluetooth® communication.**
- **3-d color animations give express results**
- **Express mode, the system registers the three measurement points automatically**
- **CCD technology,**
- **Large detector surfaces (30 mm)**



Fixturlaser GO Pro

Fixturlaser GO Pro is an uncomplicated laser alignment tool for every maintenance professional

- **Wireless: Bluetooth® communication.**
- **Pre-mounted fixtures**
- **Compound moves, Horizontal and vertical alignment accomplished without additional shaft rotations.**
- **CCD technology**
- **Large detector surfaces (30 mm)**



ACOEM AB is a global player and leader in developing innovative, user-friendly equipment for shaft alignment. By helping industries worldwide to become perfectly aligned, and eliminating anything that might not be, we minimize unnecessary wear and production stoppages. This will ultimately make our customers more profitable and our environment more sustainable.



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