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GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
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Participant Handbook

Sector
Iron & Steel

Sub-Sector
Steel, Sponge iron, Ferro Alloys, Re-Rollers, Refractory

Occupation
Mechanical Maintenance

Reference ID: **ISC/Q0905, Version 1.0**
NSQF Level 3

Fitter – Levelling, Alignment & Balancing

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Disclaimer

"Skilling is building a better India. If we have to move India towards development then Skill Development should be our mission."

Shri Narendra Modi
Prime Minister of India

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Certificate

COMPLIANCE TO
QUALIFICATION PACK – NATIONAL OCCUPATIONAL STANDARDS

is hereby issued by the

Indian Iron & Steel Sector Skill Council

for

SKILLING CONTENT : PARTICIPANT HANDBOOK

Complying to National Occupational Standards of
Job Role/ Qualification Pack: ' Fitter- Levelling alignment & balancing ' QP No. ' ISC/Q0905 NSQF Level 3 '

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Authorised Signatory
Indian Iron & Steel Sector Skill Council

About this book

This Participant Handbook is designed to enable training for the specific Qualification Pack (QP) of Iron & Steel Industry. Each National Occupational (NOS) is covered across the Units.

The job holder is responsible for alignment of moving parts (e.g. pumps, blowing fans, etc.), checking the vibration of moving parts (blower fan, pumps, motor etc.) & balancing of equipment shafts (input and output). This book is all about training of ensuring alignment of moving parts (e.g. pumps, blower fans, etc.), checking the vibration of moving parts (blower fan, pumps, motor gear box etc.) & balancing of equipment shafts (input and output) under the proper supervision.

Key Learning Objectives for the specific NOS mark the beginning of the Units for that NOS. The symbols used in this book are described below.

Symbols Used


Key Learning Outcomes


Steps


Exercise


Tips


Notes


Unit Objectives

Table of Contents

5.2.1.2 Causes of Misalignment

Causes of misalignment are:

- Because of thermal growth in machines, movement of one piece of equipment comparative to other piece can be found. Piping strain or strain induced by electrical connections.
- Strain brought by electrical connections. Movement or settling of the foundation or base plate.
- Torsional movement taking place at start-up or while operating.
- Movement or settling of the foundation or base plate.
- Inaccurate or incomplete alignment procedures (human error).

5.2.1.3 Effects of Misalignment

Effects of misalignment can be found all around in a workshop. High noise levels or constantly vibrating floors are strong indications of possible misalignment of machinery. Some of the other effects can be:

- Lost production
- Poor-quality products
- Increase in spare parts purchases Reduced profits

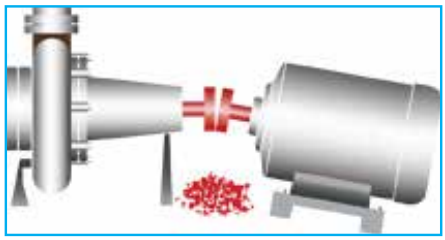

Fig 5.2.3 : Effects of misalignment

- Less profit High Bearing and coupling temperatures
- Excessive vibration
- Looseness of foundation bolts
- The breaking (or cracking) of shafts at, or close to the inboard
- High power consumption
- Movement or settling of the foundation or base plate.
- Inaccurate or incomplete alignment procedures (human error).

5.2.1.4 Indications of Misalignment

Misalignment in rotating machinery can be detected in many different ways. Some of the indications of misalignment are:

- Wobbling shafts
- Excessive vibration
- Excessive bearing temperature
- Noise
- Bearing wear pattern
- Coupling wear

Precise alignment pays off in many ways:

- Reduce power consumption
- Decrease wear on bearings, seals, shafts and couplings
- Avoid overheating of bearings and couplings
- Reduce vibrations in shafts and foundation bolts
- Significantly reduce damage to shafts and foundation bolts.

5.2.2 Methods of Alignment

5.2.2.1 Pre-Alignment Considerations

Before starting alignment process, several things have to be considered.

Soft foot: When equipment foot is not sitting flat on its base then soft foot occurs. The foot instability can be removed by tightening of foot bolts fitted with the foundation; but this action can create the strain in the bearings of equipment and may increase the vibration.

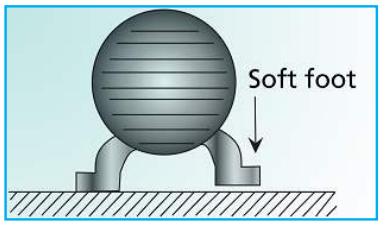

Fig 5.2.4 : Soft foot

Checking and correcting Soft Foot:

1. Loosen all the hold-down bolts and check for any gaps under the feet using a feeler gauge, as shown in Fig.
2. Eliminate the gap under the foot by placing the largest single shim that will close the gap

under each foot without raising the machine.

3. After shimming, tighten the bolt and move onto the next foot pad and repeat the procedure.

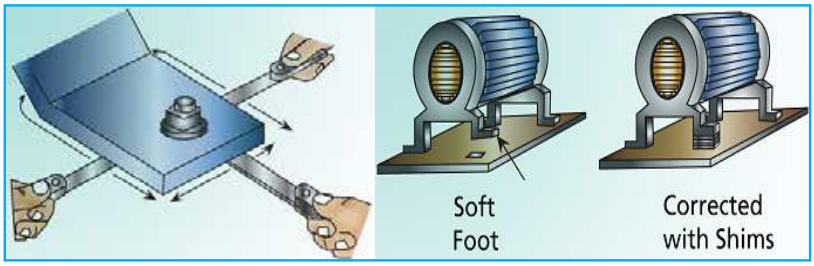

Fig 5.2.5 : Checking and correcting Soft Foot

4. If a gap still remains, place additional shims under each foot to close the remaining gap.

Bar Sag

Bar sag is simply the effect of gravity on a fixture. This effect can be measured accurately. As it affects the final accuracy of the alignment, it must be accounted for in your readings or eliminated from your fixtures before taking indicator readings.

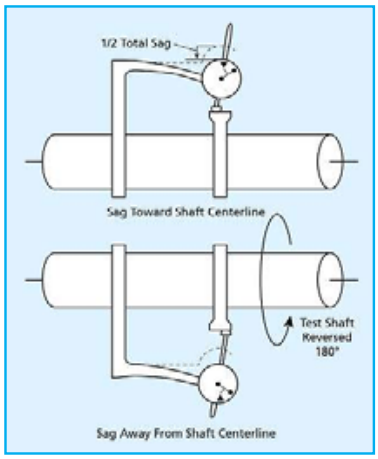

Fig 5.2.6 : Bar Sag

Determining Bar Sag:

Bar sag is determined by rigidly mounting the indicator bracket with the dial indicator stem on a firm piece of pipe resting on top in the 12:00 o'clock position. In this position, set the dial indicator at zero and then start rolling the pipe until the indicator is at the bottom 6:00 o'clock position on the pipe. In the example, the bar sag was measured at negative -.005 inch.

5.2.2.2 Methods of Alignment

It is obvious there are many methods available today to align machinery. The methods we will cover are:

- Visual Line-Up
- Rim and Face
- Cross Dial

- Reverse Dial
- LaseR

1. Visual Line-Up

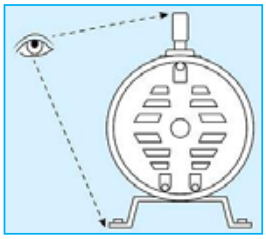

Fig 5.2.7 : Visual Line-up

The visual line-up method, shown in Figure 12, is the most common method of alignment. Used in initial installations, visual line-up allows technicians to analyze the working conditions and feasibility of installation.

2. Rim and Face

Dial indicators are used to determine the offset between coupling halves. Corrections are made under all four of the machines feet. Dial indicators measure the gap between coupling halves at the bottom and top of the coupling. The rim reading measures the offset between the coupling halves. The face reading measures the angular difference between the faces of the coupling, as shown in Figure 5.2.8.

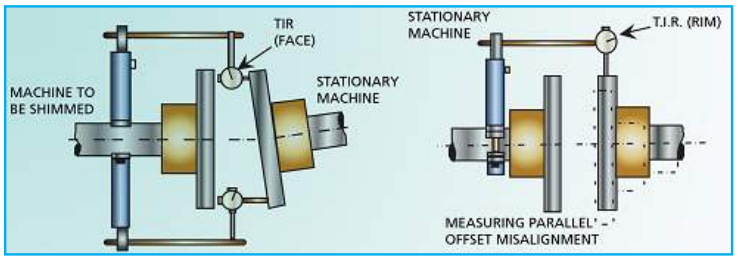

Fig 5.2.8 : Rim and face method

The rim and face alignment method is commonly used where space considerations would prevent the use of the cross dial or reverse dial methods. It also is the only method that can be used when rotation of both shafts cannot be accomplished. The results of the misalignment can only be calculated mathematically, and parallel and angular misalignment must be calculated separately.

Angular Misalignment Corrections: Steps

Step 1: Zero the dial indicator at the 12 o'clock position (3 o'clock position for horizontal moves).

Step 2: Rotate the indicator 180 and read the error from the difference in reading.

Step 3: Measure the coupling diameter of indicator travel.

Step 4: Measure the distance between the coupling face and the front foot and the rear foot.

Step 5: Calculate proper shim movement (or horizontal movement) with the following formula:

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