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MIRAGE
PORTABLE PERFORMANCE

GUIDE TO FLANGE FACING

TYPES OF FLANGE DAMAGE,FINISHES,GASKETS AND MACHINE TYPES

WHAT IS FLANGE FACING?

The process of flange facing involves the machining of flange mating surfaces on pipe and vessel connectors to produce a tight, leak-proof seal when assembled.

Flange manufacture

Flanges are available directly from manufacturers with the required surface finishes machined to industry standards. These are usually created using factory based equipment.

Installation

During pipeline construction, flanges can be damaged during handling and installation. When this occurs the sealing surface needs to be re-machined back to the original specification using portable on-site flange facing machines.

Maintenance

Portable flange facing machines are also used for flange recovery as part of routine plant maintenance processes.

TYPES OF FLANGE DAMAGE

Scratches

This type damage is narrow and elongated with sharp, shallow bottoms. However, depending on the force that created them, they can be deep. Frequently, this type damage is created by a sharp object dragging across the flange face. These objects may include the bristles of a wire brush or a tool, such as a chisel.

Gouges

These are wide and elongated with blunt, rounded bottoms and are created by a dull object dragging across the flange face. Gouges can be caused by objects—such as a screwdriver, flange jack or chisel.

Pits

This damage is usually small, somewhat rounded areas of concentrated material loss created by corrosion. Often, pits occur in clusters or groups.

Dents

This type damage can be sharp or blunt on elongated areas caused by some form of impact. Dents sometimes result from equipment collisions caused by positioning the mating flanges WHEN using cables and rigging

To find out what is regarded as acceptable damage refer to the ASME PCC-1-2013 standard.
Available at www.asme.org

FLANGE FINISHES

The ASME B16.5 code requires that the flange face has a specific roughness to ensure it is compatible with the gasket and therefore provide a high quality seal.

Commonly used ASME B16.5 Face Finishes

Stock Finish

Stock Finish ≤ 12"

- Suitable for most general surface conditions.
- Required for flange facings in direct content with a gasket.
- Created using a continuous spiral groove (often referred to as phonographic) using a 1.6mm radius round-nose tool with a feed rate of 0.8mm per revolution and a depth of 0.15mm.
- The resulting finish is a roughness between Ra 3.2 and 12.5 micrometers (125 - 500 microinch).

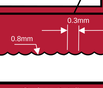
Spiral Serrated

- The spiral serrated (Phonographic) finish also uses a continuous spiral groove around the face. However, unlike the round nosed tool used in the stock finish, spiral serrated finishes have a groove that is typically generated using a 90-deg tool.
- This creates a more prominent "V" geometry with 45° angled serration.

Concentric Serrated

- This uses the same tooling at the spiral serrated finish although the grooves produced will be concentric grooves that are an equal distance apart rather than a continuous spiral groove.

Smooth Finish



Surface Detail

- Often used for gaskets with metal facings such as double jacketed, flat steel and corrugated metal.
- The smooth finish should show no apparent sign of tool markings when viewed with the naked eye..
- As with the stock finish, this finish is achieved by having the contact surface machined with a **continuous spiral groove**, but this time it is generated by a 0.8mm radius round-nosed tool at a feed rate of 0.3mm per revolution with a depth of 0.05mm.
- The resulting finish is between Ra 3.2 and 6.3 micrometers (125 - 250 microinch).

GASKET TYPES

Metallic Gaskets

Metal gaskets and those with less conformable metallic contact surfaces require a very smooth surface finish. Solid metal and corrugated designs offer very little forgiveness to flange finish or bolting and assembly deficiencies. A typical flange surface finish recommendation for these types of metal-contact gaskets is 64-µin Arithmetic Average Roughness Height (AARH)/Root Mean Square (RMS) or smoother.

Non-Metallic Gaskets

Soft gaskets, such as compressed fibre sheet and rubber can be more forgiving to misalignment and out-of-parallelism of the flange. A rougher surface finish is generally recommended for soft, non-metal reinforced materials to create the necessary friction for stability and tightness between the mating surfaces. A typical surface finish recommendation for these materials is 125- to 250-µin or rougher.

Semi-Metallic Gaskets

Made by combining soft non metallic materials as fillers, facings or insertions with a metallic core or cover. Designs include spiral wound, corrugated and jacketed. The combination of the tougher, more creep resistant metal with a more conformable facing or filler, such as PTFE and flexible graphite provides great advantages, particularly in more severe applications. For those with facing and spiral wound gaskets, a wider range of surface finishes can be tolerated such as 125- to 250-µin. For metal jacketed gaskets with soft filler, 64- to 125-µin is generally preferred.

TYPES OF FLANGE FACING MACHINE

Internally Mounted

Example above: MM3000i

Internally mounted flange facing machines are the most commonly used type and as the name suggests, when in use they are clamped inside the pipe bore.

Externally Mounted

Example above:MM600e

Internally mounted flange facing machines are used when there are more space constraints around the pipe flange.

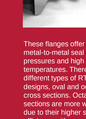
Internally and Externally Mounted

Example above: MM1080ie

This machine can be mounted either within the pipe bore, or externally, making it a very versatile product suitable for a wider range of applications.

SPECIALIST APPLICATIONS FOR FLANGE FACING MACHINES

RTJ flanges



These flanges offer a superb metal-to-metal seal under high pressures and high temperatures. There are two different types of RTJ flange designs, oval and octagonal cross sections. Octagonal cross sections are more widely used due to their higher sealing efficiency with pressures up to 10,000 PSI.

Compact Flanges

Compact flanges are more lightweight than standard flanges and bolted with higher torque. They are more complex to machine than a standard flanges because of angled sealing faces. Mirage flange facing machines can be used for this application using a compact flange conversion kit.

Valve Boring

The MM600e-9 Boring Bar attachment for flange facing machines enables the precision boring of various pipeline components. It is primarily designed for valve seat machining and is supplied with all components, tooling, depth measurement and an operating manual.

For full details of on-site portable machines to visit our website
www.miragemachines.com

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