



PTFE GASKETS

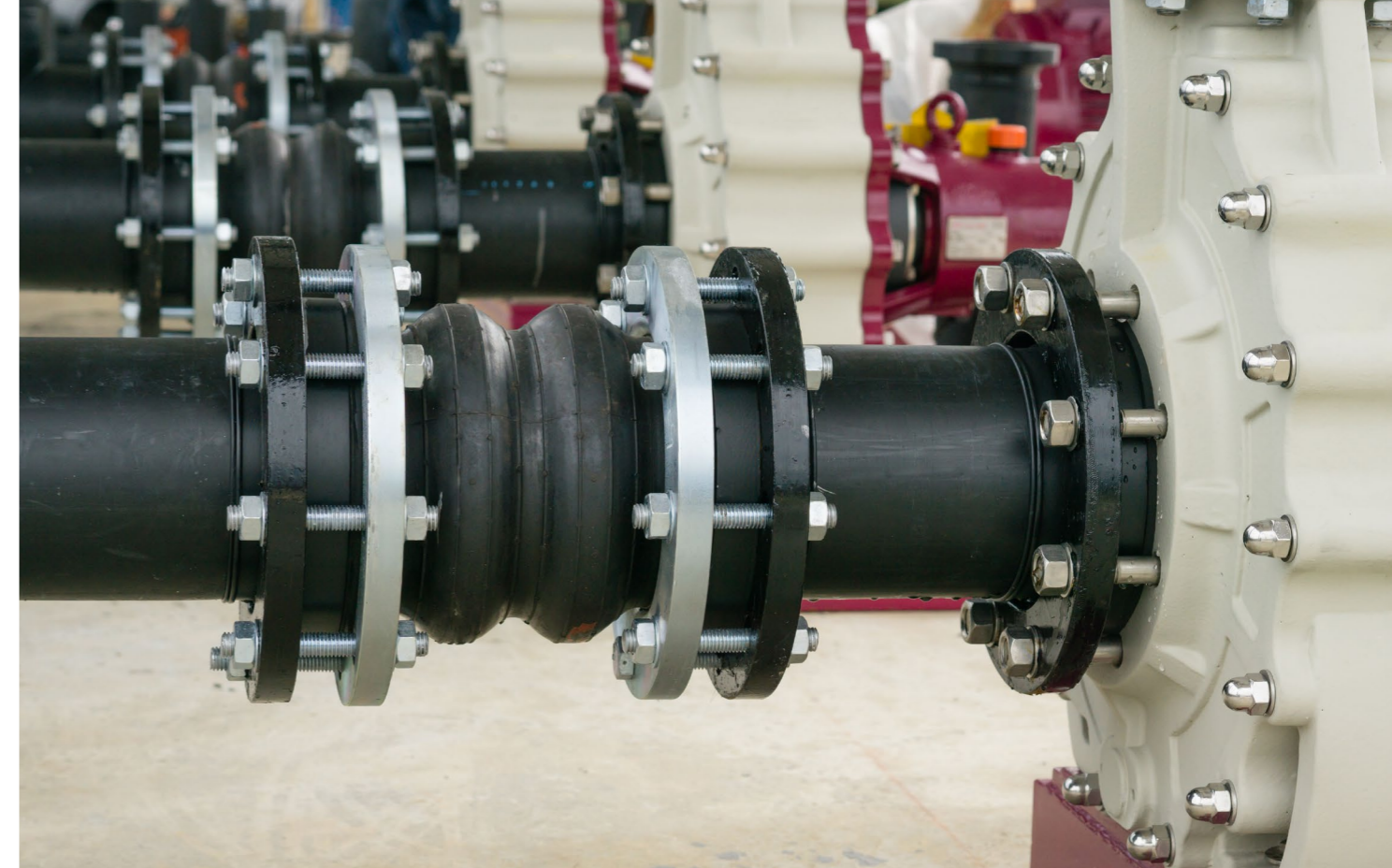
A new force in weak flange joints.

Whitepaper



CONTENTS

- 04 The problem: weak flanges
- 05 What is PTFE?
- 05 Why PTFE gaskets?
- 06 How are PTFE gaskets produced?
- 07 How do PTFE gaskets differ from other materials?
- 08 Which types of PTFE gaskets does KLINGER supply?
- 10 Installation training
- 11 Conclusion



INTRODUCTION

It all seems so simple: all a flange joint needs is the right gasket. However, many engineers and managers remain unaware of the vast world of technology, quality and applications hidden behind flange gaskets. A particularly innovative and special role in this world is reserved for

PTFE, the versatile raw material for gaskets that is giving weak flanges new strength. This whitepaper tells you everything you need to know about PTFE gaskets, as well as about how PTFE is helping KLINGER build a safer and more sustainable process industry.

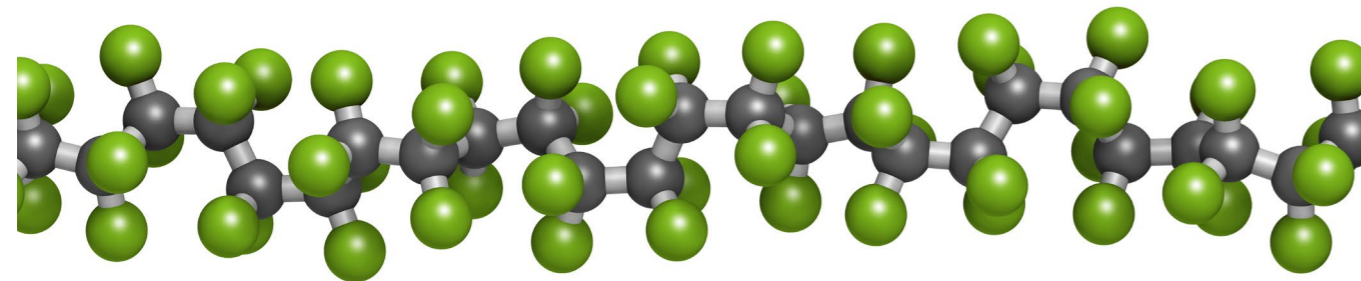
THE PROBLEM: WEAK FLANGES

One in three flange joints in the industrial sector is unable to handle high bolt loads. That might sound strange at first, as flanges are usually custom-designed for specific applications. Regardless, the problem of weak flange joints is widely known among professionals who work with them on a daily basis.

The cause of the problem is often the choice of flange material, such as plastic. When a plastic flange is squeezed, it deforms. In some cases, bolts are the weakest link, due to the maximum permissible load that can be placed on them. If that load is exceeded, the head of the bolt may snap off. Other causes include inferior material quality or incorrect assessment of the dimensions and thicknesses required.

In these weaker joints especially, the correct gaskets are crucial: they can make the difference between carefree operations or major problems. As the requirements in relation to safety, sustainability and the environment are getting stricter by the day, only gaskets of the best quality available can guarantee long-term success.

Just think about sectors in which tanks need to remain sealed under all circumstances for a number of years, or imagine a container truck loaded in hot and humid Texas that then travels to a hot and dry Asian country via various colder areas: the flange joints must remain sealed whatever happens, even though everything about these thin, weak joints is a possible cause for leaks. Specialist PTFE gaskets are the solution to this problem and guarantee that containers remain perfectly sealed for years on end.



WHAT IS PTFE?

- » Polytetrafluoroethylene (PTFE) is a type of plastic with a very low friction coefficient. It is generally highly resistant to chemical reactions and has a melting point of 327 °C.

Industries that process acids or other aggressive substances are generally already using plastic pipes and flanges. Appendages such as taps, valves or shut-off devices are usually lined with a layer of PTFE.

WHY PTFE GASKETS?

Gaskets are expected to do their job without issues, often in service for a number of years. Temperature, pressure and, above all, chemical resistance help determine the quality of these joints. A gasket that partially comes into contact with the chemical substance flowing through the flange and starts reacting to it may dissolve or tear as a result. This will inevitably lead to leaks, as the seal will no longer be resistant to the process conditions of the flange.

PTFE gaskets have the advantage that they are chemically inert and resistant to corrosion and nearly all acids or alkali in environments up to 260°C, meaning any chemical 'attack' on the gasket is as good as impossible.

THE DIFFERENCE BETWEEN MODIFIED PTFE AND ePTFE

- » Aside from conventional PTFE, gaskets are also produced from ePTFE. This is a so-called expanded PTFE, which results in a softer material that is stronger than conventional PTFE. A filler such as silicon dioxide, silicon carbide or barium sulphide is added to the PTFE to prevent deformation when compressed. These fillers are not used in ePTFE — the mechanic reinforcement of this alternate version happens during the expansion process of the material.



HOW DO PTFE PACKINGS DIFFER FROM OTHER MATERIALS?

As safety, sustainability and environmental requirements are getting stricter, more and more businesses in the chemical, pharma and food industries are opting for PTFE.

The three main advantages of PTFE gaskets are:

1. HIGH LEAKAGE INTEGRITY

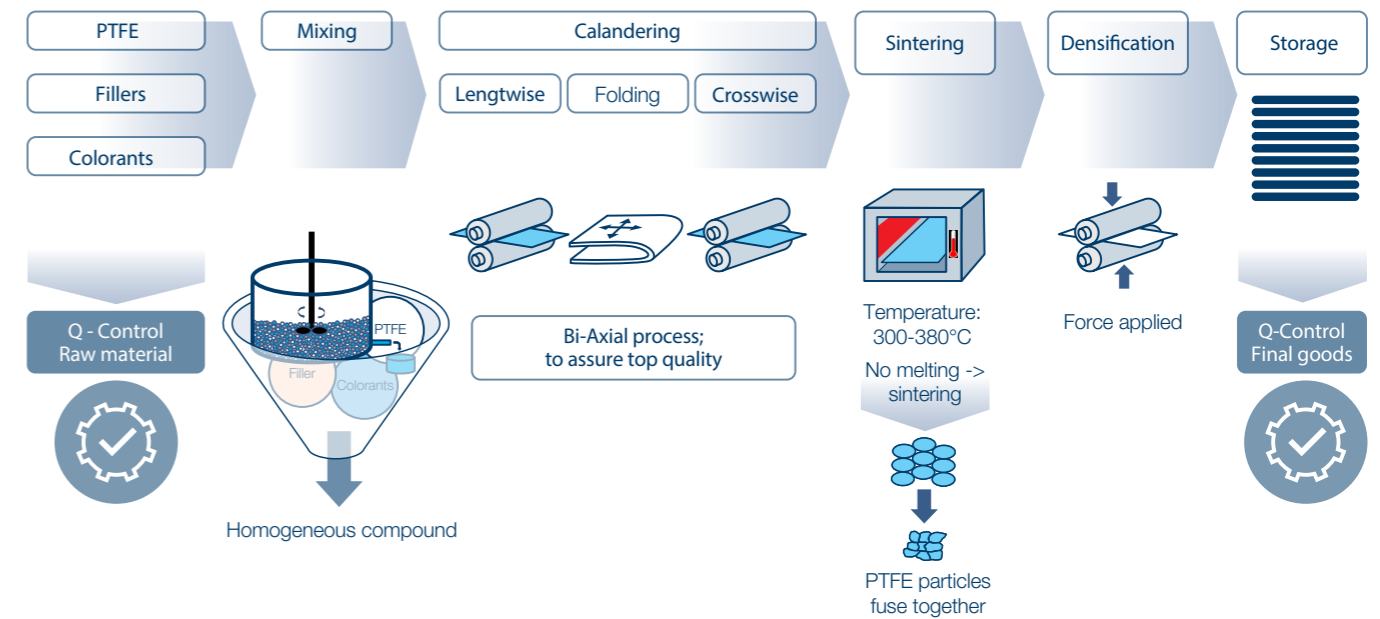
PTFE gaskets are easily compressed at low bolt loads. This is particularly true of versions with a corrugated structure. The result is a high leakage integrity at low to very low bolt loads and/or weak flange joints.

2. LOW BOLT LOAD

In thick flanges, the bolt load is spread across the entire surface of the gasket. However, thinner and weaker flanges bend more quickly due to not having sufficient mass, which leads to the flanges being pulled towards one another at the bolts, with leaks forming as a result. This destructive pulling force does not happen with PTFE gaskets, which require a much lower bolt load.

3. EASY TO INSTALL

PTFE gaskets are easy to replace. When PTFE gaskets are removed, no residue is left behind on the flanges, which means the new gasket can be installed straightaway as the flanges don't even have to be cleaned. These quicker installation times deliver a lower total cost of ownership.



» PTFE GASKETS ARE BAKED IN AN OVEN. A FEW DIFFERENT STEPS ARE REQUIRED BEFOREHAND THOUGH... «

HOW ARE PTFE GASKETS PRODUCED?

Simply put: PTFE gaskets are baked. A few different steps are required beforehand though. If you flatten a block of PTFE, it will creep, just like rubber. PTFE retains its shape when a filler is added. When this happens, the forces the material is exposed to have much less of an impact on its deformation.

Once colourants and other substances have been added, a mixing process is started. The dough-like matter is pressed and folded into a layered structure. This strong network of PTFE molecules grip onto one another at different levels. Finally, the PTFE is baked in an oven: this causes the chemical ingredients to 'stick' to one another, leaving the material ready for gaskets to be cut.

One special variant of PTFE gasket is PTFE with a corrugated surface, which is also referred to as Waveline. KLINGER Waveline is a unique, formed PTFE gasket. A wave like structure is created with no insert and provides 'point loading'. Point loading is the result of increasing load on a reduced area, creating an extremely high integrity seal, even at low bolt loads.

On the contrary, the PITA version of PTFE gasket does have elastic properties. Corrugated metal rings are added to this variant. These rings are seamlessly integrated into PTFE gaskets to make sure that it does bounce back to its original shape. As the metal is completely embedded, it never comes into contact with possibly reactive substances.

WHICH TYPES OF PTFE GASKETS DOES KLINGER SUPPLY?

KLINGER offers a line of PTFE gaskets that meets the highest quality requirements and leak classes, and that are also specifically aimed at every application required in the industrial sector:



» KLINGER@TOP-CHEM 2000

This line is intended for nearly all applications up to 260 °C, including acidic and alkaline substances and steam. These products are Fire Safe, but are also highly suitable as plug gasket or sealing cord due to their low friction and high strength. The seals in this series are less suitable for weak flange joints.

» KLINGER@TOP-CHEM 2003

This series is suitable for chemicals in plastic and/or glass/ceramic pipework systems and at low temperatures. These gaskets are also relatively soft with a low creeping tendency, which makes them ideal for foodstuffs and processes in the pharmaceutical industry.

» KLINGER SOFT-CHEM

This collection of expanded PTFE packings is suitable for nearly all substances in flange joints in which low bolt loads are the only option. These packings feature high compressibility, but with the chemical resistance of PTFE. Seals in this line are also available as tape under the name KLINGER Sealex.

» LOAD LOCK

Load lock gaskets are easy to produce in all possible forms: round, oval, square and much more. Aside from retaining their shape under high temperatures and surface pressures, this type of gaskets is highly resistant to creep.

» KLINGER@TOP-CHEM 2005

The PTFE gaskets in this line are suitable for nearly all applications, including chemicals, and particularly for acids with extremely low pH values. Aside from being economical and universal, these gaskets have high chemical resistance, good gas tightness and excellent creeping resistance.

» KLINGER@TOP-CHEM 2006

This series of colourant-free gaskets is suitable for chemicals, alkali and lyes such as NaOH and KOH, and ideal for applications in the food and pharmaceutical industry where discolouration due to packing must be prevented.

» PITA@DNA™

The gaskets in this series consist of ePTFE with an integrated corrugated insert. They are extremely suitable for portable tank containers and flange joints in which low bolt loads are the only option. The VSP gaskets guarantee extremely tight joints and leak-free reliability in the long term. On top of that, these gaskets deliver cost savings on retorquing. Once they have been installed, there is no need to retorquing them in time, resulting in time savings on putting installations into service.

» KLINGER KEMPCHEN PW1A-3

PW1A-3-type TA-Luft gaskets consisting of an optimised corrugated insert in 1.4571 (316Ti) material, enveloped on both sides with PTFE and with a graphite MF layer on the outside. Due to the soft malleable envelope, these gaskets are highly adaptable vis-a-vis flange surfaces, while the geometry of the corrugated insert guarantees high stability and easy handling. Our type PW1A-3 gaskets are tested according to VDI 2440 and comply with all criteria according to TA-Luft. They are also Fire Safe-certified according to ISO EN 10497.

INSTALLATION TRAINING

Ongoing support for engineers in choosing and installing gaskets is essential. KLINGER has developed a complete training programme, both on location and in-house. Under the motto 'Knowledge is power, but sharing knowledge is strength', KLINGER offers training sessions that are fully developed in consultation with the client. This results in a company-specific form of training that exclusively covers elements that relate to the products and processes of

the client. This allows KLINGER to better meet specific requirements, solve problems and improve the efficiency of industrial installations.

All the information you need about this training programme can be found [here](#).



CONCLUSION

PTFE gaskets are essential to meet the ever-stricter requirements in terms of safety, the environment, sustainability and cost-effectiveness. Weak flange joints that sometimes consist entirely of plastic particularly stand to gain in terms of strength and lifespan from using this type of seal.

- » EASY TO USE
- » NO EMBRITTLEMENT
- » HIGH RESIDUAL STRESS IN THE GASKET
- » NO MATERIAL AGEING
- » DOES NOT STICK TO FLANGES
- » LONG LIFESPAN
- » WIDE RANGE OF APPLICATIONS
- » HIGH NUMBER OF CERTIFICATIONS

In industrial processes that use flanges with limited bolt loads, ePTFE gaskets with an integrated corrugated insert are the best solution for reliable joints that will last for years. When developing installations, engineers and managers often tend to opt for thin and cheap gasket. However, practical experience has shown that this choice often leads to disappointment, as inferior, non-PTFE gaskets in weak flanges almost always have a detrimental effect on their wallets.

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