

OVERCOMING GALLING ISSUES WITH PREMIUM STAINLESS STEEL FASTENERS



BUMAX[®]

WHAT IS **GALLING**?

Galling is a form of adhesive wear caused by excessive friction between two moving surfaces. The process involves material being torn up and transferred between the two surfaces when they are under sufficient load that compress the surfaces together.

STANDARD STAINLESS STEEL FASTENERS ARE PRONE TO GALLING

Standard stainless steels have a tendency to gall under certain conditions due to their properties.

Thread galling can occur with standard fasteners when pressure and friction cause the bolt threads to seize to the threads of a nut or tapped hole.

Severe galling, known as 'cold welding', can cause the two surfaces to fuse together. This can make the joint impossible to disassemble and may require the bolt to be cut or the nut to be split.



A galled standard bolt with nut removed

Galling is a common issue with standard stainless steel bolts and can pose serious problems for critical fastener applications. However, galling can be overcome even in the most challenging of applications – particularly by selecting premium quality stainless steel fasteners.

THE POTENTIALLY DISASTROUS IMPLICATIONS OF GALLING

The consequences and implications of galling should not be underestimated.

A galled fastener may not be able to achieve the necessary pre-load – this can be especially important in cases where a connection maybe subject to dynamic loading. Imagine critical fasteners in the rotating parts of a chemical pump or propeller galling. Insufficient pre-load in the bolt or clamp force in the joint, may likely lead to an increase in risk of fatigue failure, which could require costly maintenance and downtime for the customer or end-user.

However, in the worst-case scenario, the fatigue breakage of critical fasteners can have serious safety implications that might result in accident or injury.

Galled fasteners are also much more susceptible to corrosion, which can ultimately result in breakage.

HOW CAN GALLING BE PREVENTED?

Stainless steel fasteners offer several properties that are essential in many critical fastener applications, such as corrosion resistance.

Despite a tendency for standard stainless-steel fasteners to gall under certain conditions, the good news is that galling can be avoided by selecting premium fasteners and taking preventative measures.

It is important to consider how galling can be avoided from the outset when designing a particular fastener application in order to avoid a great deal of rework, maintenance and costs further down the line.



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TIPS THAT CAN HELP SOLVE GALLING ISSUES



#1 CORRECT MATERIAL SELECTION

Stainless steels develop a passive chromium oxide layer which then helps to protect the underlying material. However, this passive layer along with various alloying elements can affect a material's sensitivity to galling.

Hardened stainless steel is more resistant to galling than annealed (softened) stainless steel. In particular, high strength strain-hardened stainless steel fasteners such as BUMAX provide excellent galling resistance due to their increased strength and higher levels of hardness.

Galling is also influenced by the difference in hardness between contacting surfaces, therefore selecting the correct material for your specific application is especially important.



#2 CHOOSE PREMIUM FASTENERS

As galling is common between metal surfaces that are in sliding contact with each other, premium fasteners that are designed to perfectly fit together can significantly reduce the risk of galling as they minimize movement and friction.

Here, high-quality threads with less surface deviations that can rub together and lead to galling issues are essential.

For example, thread rolling is a premium fastener manufacturing technique that ensures greater surface hardness, higher-quality and smoother thread, compared with cut threads. Good quality threads, with no sharp thread crest or surface defects, are extremely important when producing fasteners that are far less susceptible to galling.



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TIPS THAT CAN HELP SOLVE GALLING ISSUES



#3 LUBRICATION

Lubrication can reduce galling by allowing the two materials to slide past each other with considerably less friction. BUMAX's leading range of premium fasteners includes custom-made wax that is applied during the manufacturing process to provide a consistent friction coefficient of around 0.10-0.12. This also helps to enable more accurate torque-pre-load calculations. Anti-seizing and anti-galling lubricants can also help reduce galling.



#4 DON'T USE DAMAGED FASTENERS

A bolt with dented or damaged threads is at significantly increased risk of galling.

Check all fasteners for damage that may have occurred during shipping. Dirty bolts with debris in the threads can also greatly increase the risk of galling – so make sure you only use clean bolts.



#5 CAREFUL INSTALLATION

The stainless steel passive chromium oxide layer can be damaged by high temperature and pressure. Tightening bolts more slowly can help to reduce the risk of galling.

This may involve avoiding the use of high speed power tools that can increase the effects of friction and heat generated. Consideration should be made for particular applications, to determine the kind of tools that can be used.



CASE STUDY

OVERCOMING SEVERE GALLING IN JAPAN

NARA Machinery invested in premium stainless steel fasteners for their powder-handling machines to successfully overcome severe galling issues.

Severe galling issues with standard fasteners

Japanese company **NARA Machinery** manufactures powder-handling machines for various industrial customers around the world. Many of the machines require a high degree of air tightness with firmly tightened stainless steel screws.

However, as the screws have powder contact and cannot be lubricated, they are highly susceptible to thread galling issues.



We previously used standard 304 and 316 stainless steel screws for all our machines, but our customers experienced galling and gorging issues with these screws.

Kennichi Johara
Technical Director,
Nara Machinery

"The screws also had air leakage issues and required frequent removal for cleaning and maintenance purposes."

Such issues and maintenance needs resulted in costly procedures and downtime for NARA Machinery's industrial customers. "In the worst instances, galled screws had to be cut and carefully removed and replaced to protect against dust getting into the machine," says Johara.

Solution immediately overcomes galling issues

"But then we found BUMAX and tested installing BUMAX® 88 screws on a customer machine in Japan that had experienced galling issues," says Johara.

"Since installing BUMAX® screws, the customer has not reported any issues with galling or air tightness."

Developing higher-quality machines

Following this successful trial, NARA Machinery has recently built a brand-new machine with BUMAX® 88 screws.

Going forward, we plan to use BUMAX® screws for all new powder-handling machines we manufacture that require air tightness," says Johara.

"This will help our customers avoid the need for costly downtime due to the maintenance and replacement needs related to galling."

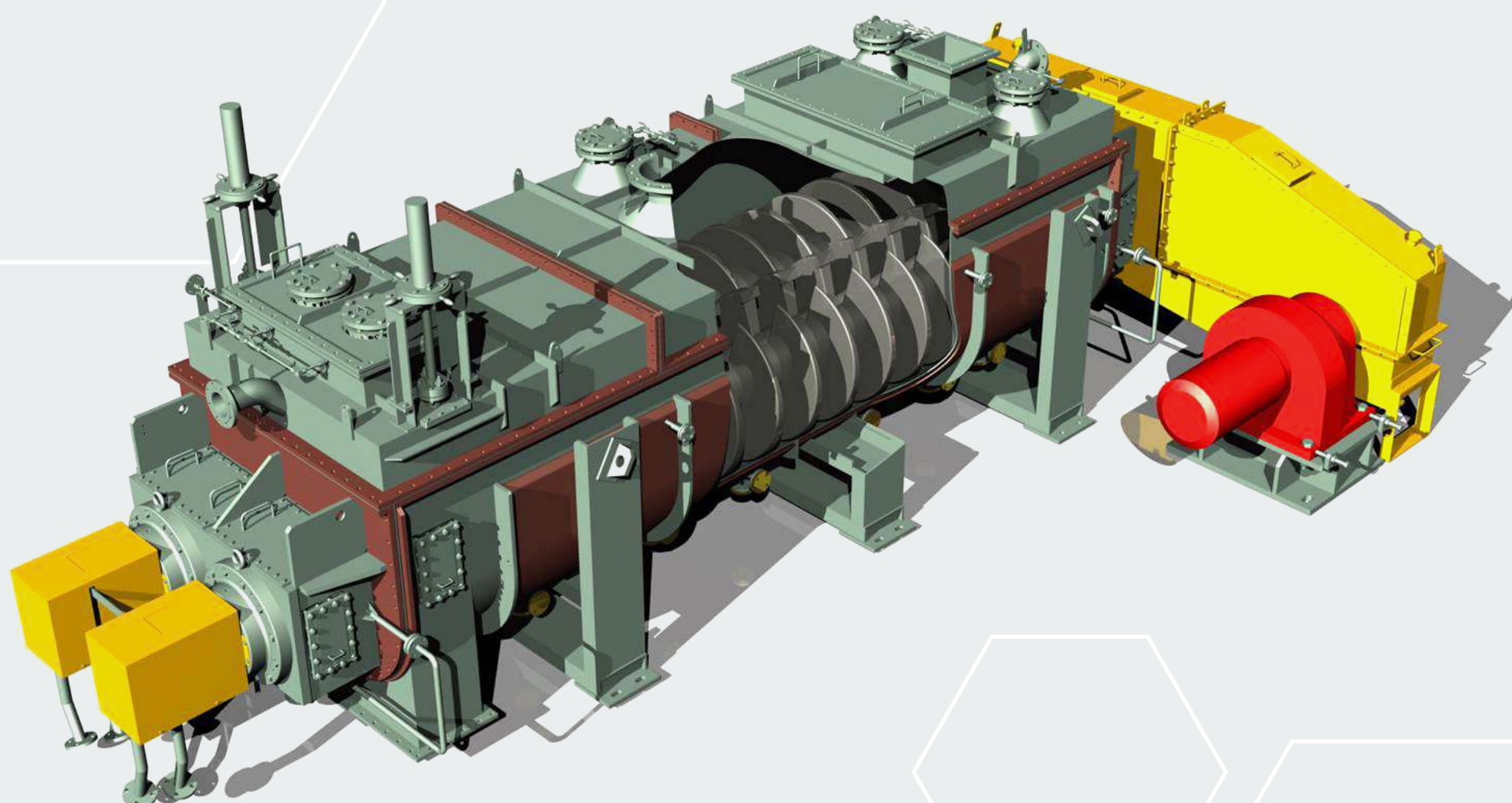
The use of BUMAX® 88 screws has helped NARA Manufacturing to further develop their high-quality powder-handling machines.



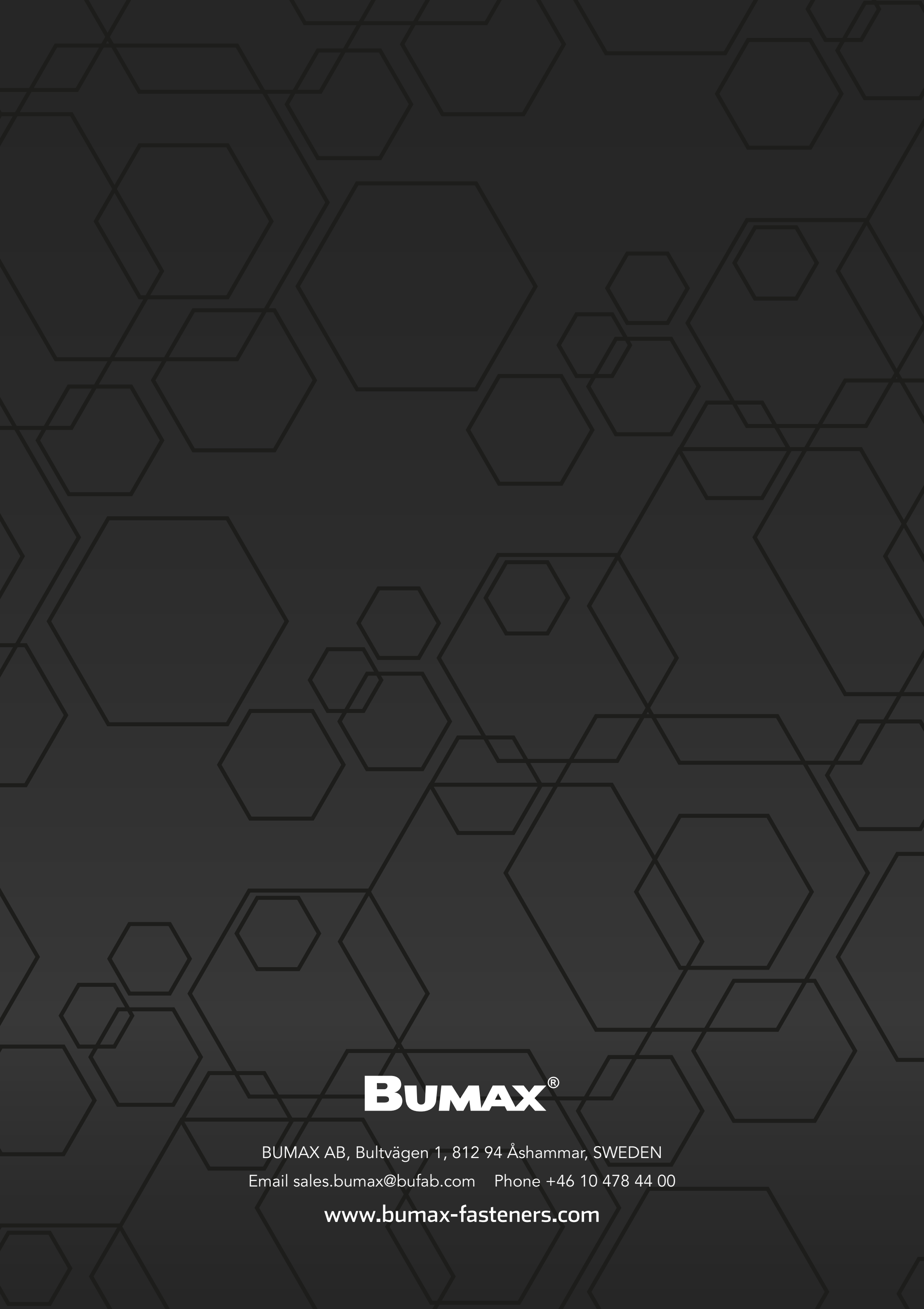
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We are very happy to have found BUMAX, and I would strongly recommend BUMAX products to other companies that experience similar galling issues.

Kennichi Johara
Technical Director,
Nara Machinery



The NARA Paddle Dryer Powder Machine



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