

Heavy Price of Poor Maintenance and Sloppiness

"Poorly maintained equipment and sloppiness can lead to serious accidents."

Introduction

We can encounter this old truth in preamble almost every day in various areas of economic activities. The latest dramatic explosion in a Malaysian (April 1, 2025) gas pipeline (**Fig. 1**) would be a reminder. Leaks in the gas pipeline send fire spreading to villages.

How much more pleasant is the sight of a bird flapping its wings on a leaky water pipe (**Fig. 2**). Unfortunately, emotional feelings play no role here. In both cases, the cause was a leak in the pipe; in the first case a gas pipe, and in the second, a water pipe.

There is no point in continuing to calculate the consequences of accidents caused by insufficient ongoing care of gas or liquid pipelines. It is important to analyze them and take the necessary measures. Pointing out possible causes and providing a proposal for appropriate measures is also the mission of this contribution.



Fig. 1. Gas explosion (Wiki)



Fig. 2. Bird on a leaky pipe

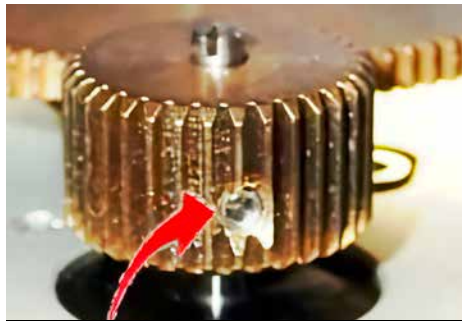


Fig. 3. Incorrect small screw installation

Possible Causes

1. Incorrect screw installation

In July 2020, the ship Atlantic Huron, a 736-foot bulk carrier, lost its propulsion control. The ship was attempting to slow down, but instead it was speeding up. This led to the ship barreling into a pier, causing great damage. It was due to an incorrect installation of a small screw on the propeller machinery that controlled pitch (**Fig. 3**).

2. Incorrect material and excessive strain

An error in choosing the material for the car wheel mounting bolts and their excessive strain (**Fig. 4 - 6**) caused a serious traffic accident.

3. Pipe leakage

One specific problem is pipe leakage, which can occur in three ways:

- Corrosion (**Fig. 7 - 9**)
- Loosening of bolted joints
- Damage to the seal on flanges

Corrosion itself is also a specific problem for pipelines. In contrast to the common types of corrosion of bolted joints, there is external or



Fig. 4



Fig. 5



Fig. 6





Fig. 7 Rusty flange



Fig. 8 Crack in a pipe



Fig. 9 Welding



Fig. 10 Welding at height

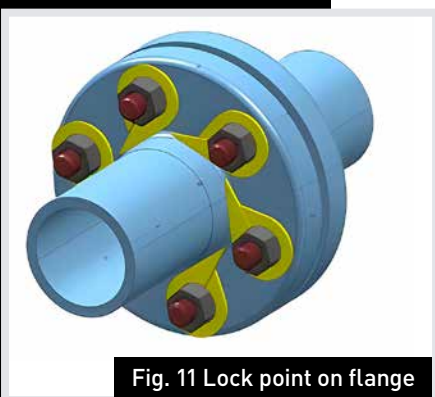


Fig. 11 Lock point on flange

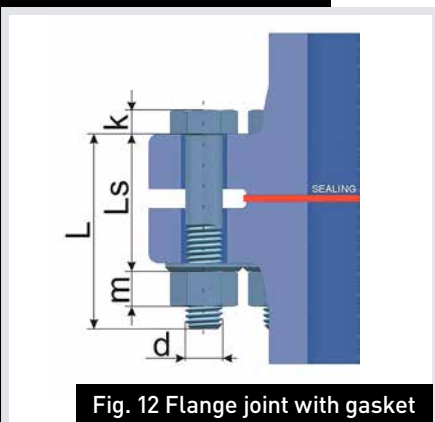


Fig. 12 Flange joint with gasket

atmospheric corrosion and internal corrosion as a result of the effect of aggressive components contained in the transported medium. It is not uncommon for it to be a combination of both. Welding a steel sheet (Fig. 9) is only effective for a short time. If the area around the weld is not treated properly, it corrodes very quickly.

It is also important to take into account the fact that pipe repairs often take place in hard-to-reach places (Fig. 10). Sometimes it is a difficult and expensive matter. Not only pipeline repair at height is at least twice as expensive, it is also more difficult than on the ground. The same applies to routine checks of the condition of bolted joints in hard-to-reach places.

The role of screw connections is not only to connect, but also to prevent the disintegration of already connected parts, so that the above-mentioned cases of accidents can never occur. Loosening of prestressing force in flanged pipe joints means loss of tightness and leakage of medium into the surroundings. A preventive measure is needed here, which should be considered as a proper investment and not as an expense item.

One of them is the installation of a lock point (Fig. 11). It is a simple, inexpensive and, above all, effective method of bolting locking. However, it is necessary to tighten the screws correctly beforehand.

One of the factors that determine the success of joint tightness when tightening a flange is the tightening sequence of the bolts, which ensures a balanced tension throughout the joint (Table 1).

| Table 1. | | | | | | | | | | | | | |
|----------------|--------------------------|---|---|----|---|---|---|----|---|---|---|----|--|
| Number of Bolt | Bolt Tightening Sequence | | | | | | | | | | | | |
| 4 | 1 | 3 | 2 | 4 | | | | | | | | | |
| 8 | 1 | 5 | 3 | 7 | 2 | 6 | 4 | 8 | | | | | |
| 12 | 1 | 7 | 4 | 10 | 2 | 8 | 5 | 11 | 3 | 9 | 6 | 12 | |

However, loss of tightness can also be caused by degradation of the sealing washer (Fig. 12); therefore special attention must be paid to the selection of suitable materials.

Here too, the proven rule applies that the designer must know in what environment and under what operating conditions his future design node will operate. This should be contractually stipulated on the customer's side, because it is very important.

Conclusion

It is not for nothing that it is said that even small mistakes can cause big problems. This is also fully true for the technique of mechanical joining of components. This article provides a few practical examples that confirm this.

Finally, a few useful tips:

1. Important screw connections must be clearly visible and easily accessible for possible repair or replacement.
2. Bolted connections must not be the weakest link in the structure.
3. Regular inspection and maintenance are important.
4. In the case of manual replacement of a car wheel, visit an authorized service center as soon as possible.
5. Precise tightening.
6. When installing car wheels, respect the coefficient of friction. It is not the same to tighten aluminum and steel wheels. ■

