

# PSC Tech Topics

## Torsionally Tuning a Gas Compression Package



### Why Choose PSC Disc Couplings?

- Longer equipment life with industry leading high torque density and low restoring forces
- Quick and easy installation with self piloting, fully assembled, and collapsible disc pack cartridges
- Better balance with precisely manufactured components and piloting features
- Coupling stiffness can be customized offering lower cost and better performance in gas compression packages especially where detuners are needed or where an elastomer coupling is recommended



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In most reciprocating gas compression applications, there must be a torsional vibration analysis performed. This is done to ensure there are no destructive harmonic resonances occurring in the drive train during operation. During this process, there is most often tuning required in order to ensure the system operates far enough away from these potential natural frequencies. This system tuning occurs in two main ways: 1) adding inertia (mass) in various locations along the drive train or 2) changing the torsional stiffness characteristics of the connecting coupling. In some rare cases, very little if any tuning is required, but when tuning is required, it directly increases the cost to the packager and subsequently the end user.

Let's look at the following tuning methods and their subsequent cost to the OEM packager.

### **Oversized Coupling – \$**

This is a very common method of system tuning. This method is the easiest and least expensive way to increase torsional stiffness which increases the subsequent system resonance frequency. Although it is very economical, it can be problematic when couplings are specified with very high service factors. They then no longer function as a fuse in the drive train and lose their ability to protect the connecting equipment.

### **Coupling Inertia Add – \$\$**

This is also very common method of system tuning. This method will not change the torsional stiffness of the coupling, but it will decrease the subsequent resonance frequency. It is generally more expensive than just oversizing the coupling, but it has an opposite effect. This is generally the preferred method of adding inertia; however, sometimes the amount of inertia required isn't achievable through adding it to the coupling.

### **Compressor Detuners – \$\$\$**

This is a costly, less desirable solution compared to adding inertia to the system. Sometimes it is unavoidable because of the required amount or location that the inertia needs to be added. This involves opening up the reciprocating compressor and adding heavy plates to the crank shaft of the reciprocating compressor. In many cases, this method of inertia add can be 3 or 4 times the cost of the entire coupling.

### **Torsionally Soft Coupling – \$\$\$\$**

In some cases, a system is un-tunable. This can be for a variety of reasons. One of which arises from the fact it is very hard, if not impossible, to lower stiffness in most of the common disc coupling brands in the gas compression market. This limitation creates an opening for torsionally soft product that, while very reliable, presents another set of challenges due to their limited operational life as well as their limited shelf life. Plus, they require maintenance intervals in order to insure the perishable rubber inserts are still functioning as intended. It is because of these factors that typically OEM packagers tend to only use torsionally soft couplings as a last resort.

### **PSC Couplings for Gas Compression**

PSC offers the Series 47 (Engine) and Series 57 (Motor) Gas compression couplings. These couplings have been specifically designed to allow for maximum flexibility in tuning. It is by design a much lower stiffness than the traditional disc coupling alternatives. Because of its fully machined design, it can be fully compatible with API-671 and yet allow for custom torsional stiffness tuning. The ability to reduce the stiffness of the coupling through custom center spacers is an option that isn't readily available with the low cost imported cast center spacers of our competitors.

PSC contracted IDC Technical Services in Peoria, Illinois to run a sample analysis on a Motor driven Reciprocating compressor package that previously required the addition of compressor detuners as well as special startup testing by the compressor manufacturer prior to commissioning. These significant costs could have been avoided if a PSC Series 57 coupling would have been evaluated. The PSC Series 57 coupling merely required a small amount of inertia to be added to its hub in order to achieve as good or better performance than the current coupling selection plus detuners.

Next time you are having your package analyzed for torsional resonances, please make sure you check out PSC. We may be able to save you time and money.