

# Garlock 3-D Seal

## Case Study: Sugar Refinery



### Industry

Food Processing – Sugar Refinery

### Customer

A major global cane sugar refiner.

### Background

The customer's sugar crystallizer agitator was not performing properly with the PTFE compression packing that was installed. To crystallize sugar, the syrup is heated to evaporate the water content. This is best done under a vacuum to allow lower process temperature, thereby significantly reducing the chance of discoloring (burning) the crystals. The system was designed to use compression packing to seal the area where the shaft entered the crystallizer. The packing was allowing air to enter the system, thereby increasing the chance of spoiling a batch.

### Challenges faced

The crystallizer is housed in a 3 story building and contains a 6.7 m long 15 cm diameter shaft with a steady bearing at the bottom and the drive motor on top. The stuffing box held seven rings of PTFE packing. The maintenance personnel would have to climb to the top of the crystallizer 3-4 times per week to adjust the packing, thus presenting a heightened safety risk. Despite these adjustments, the packing was still unable to hold the required vacuum.

It was determined that a mechanical seal would allow the system to operate under a vacuum. However, the shaft had an indicated 1.25 cm – 1.27 cm of radial run-out. Finding the correct seal that would be able to hold a vacuum and move with the shaft was the goal.

### Operating Conditions

1. Media: Sugar
2. Speed: 0.6 m/s
3. Temperature: 60 °C
4. Pressure: operates under a vacuum
5. 1.25 cm – 1.27 cm radial run-out during operations

### Solution and Benefits

Garlock 3-D Seal was chosen. The seal combines PS-SEAL® technology to seal the rotating shaft without external lubrication, a close tolerance bearing to maintain seal concentricity with the shaft, and a Garlock 214 PTFE expansion joint to allow the entire seal to "move" with the shaft. The seal was designed to install with minimal modifications to the customer's equipment. The resulting solution has significantly reduced maintenance time. The sealing system has been running up to one year without any adjustment. The customer is now also able to control the vacuum pressure reliably and consistently. They are so satisfied with the result, they are now converting the remainder of their crystallizers (5 x units) to use the Garlock 3-D Seal.

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