Surge Protection

Applicability: TT300 - all models

The TT300 compressor has been tested in accordance with IEC standard 1000-4-5, 'Surge voltage immunity requirements'. However in practice, much higher surge currents can occur, leading to higher surge voltages than the compressor has been tested to. Therefore it is advised to install extra surge protection.

This article discusses surge origin, quantification, and how to select the surge protection.

When there's talk of surges and surge protection, you automatically enter this gray area where most people will know something of it, but the details are usually hard to grasp and often forgotten. On the other hand, if there is a lightning storm somewhere, isn't the only thing that's relevant is that vital equipment keeps functioning? However, it's important to understand some of the background of surges and surge protection to be able to take appropriate measures.

Surge Origin

Surges can be caused by:

- Externally generated transients such as lightning strikes or utility power correction switching.
- Internally generated transients primarily caused by inductive loads cycling on and off.

Of course, direct lightning strikes are the most severe ones (and the least understood) and switching a tube-light on and off will hardly cause any surges. Between those two extremes, anything can occur.

Quantifying Surges

To help the engineering community deal with surges in a systematic way, different surge levels have been identified by the standardization committees (ANSI/IEEE, IEC).

IEEE C62.41 is a standard describing the causes and severity of transient voltages as they appear within the boundaries of a facility, based on their probability.

Three separate facility locations are defined:

- Service entrance (Category C – the most severe)
- Distribution panel or switchboard (Category B)
- Individual circuits (wall outlets, Category A)

Simply put, it means: at a service entrance the probability and severance of a surge is higher than at a distribution panel or a wall outlet. Therefore, at a service entrance, a larger amount of suppression capability is required than at a switchboard.

A Protection Concept

When applying the logic of the C62.41 standard at each facility location, appropriate surge suppressors should be installed. However, the selection of such devices is not an exact science.

The first step is to establish how much surge suppression capacity should be installed. As a rule of thumb for the Turbocor TT300 compressor, a surge suppression capacity of 80kA is sufficient for low to medium exposure protection and 160kA will offer protection for medium to high exposure applications.

The second step is to look at the clamping voltage of the surge suppressor. The clamping voltage is the amount of voltage a suppressor permits to pass through in the event of a transient. In general, a lower clamping voltage gives better surge protection.

A very helpful tool to determine the amount of suggested surge protection can be found at: www.apttvss.com/surgecalctm.htm. It takes into consideration the probability of surges and their severity, and combines it with the cost of a possible failure.

To properly install the selected surge suppression, refer to the manufacturer's details.

When all suggested measures have been taken, there could still be an equipment failure due to a surge, but at least the risk/cost factor will be much better than without any protection.