Vortex Heating Eliminates Gas Combustion and Consumption At Pressure Regulation Stations

- **NO LOST GAS**
- **NO CARBON EMISSIONS**
- **NO MAINTENANCE**
- **'GREEN' TECHNOLOGY**

No external energy (combustion, chemical or electricity) needed to heat the gas

Universal Vortex Inc. offers a technology that provides non-freeze pressure reduction and maintains gas discharge temperature above 39ºF at the locations where, otherwise, line heaters are applied.

The technique is based on the proprietary Self-Heating Vortex Tube. The Vortex Tube is a specially designed cylindrical device with no moving parts. The Vortex Tube takes a high-pressure gas and, in the course of its depressurizing, converts the inlet gas flow energy into two low-pressure streams (cold and hot) which exit the VT separately. The generated hot gas prior to exiting the VT is used to warm the unit inlet orifice (spot heating) thus eliminating the likelihood of freezing.

The Self-Heating Vortex Tube has proven to perform efficiently over a broad range of operational parameters, even handling a single pressure cut of over 1,100 psi pressure differential.

In the Vortex Pressure Regulation Station (VPRS) the Self-Heating VT is used as a primarily pressure regulator that performs non-freeze pressure reduction without the need for the high-pressure gas pre-heat.

The required gas temperature of 39ºF or more at the VPRS discharge is achieved by dissipating the vortex cold flow energy into an external medium (heat exchange with the transmission gas) and then by combining the original vortex hot flow with the now warmed vortex cold flow.

The size of the required heat exchanger is typically small since the vortex cold gas and the transmission gas temperature differential is high, and the vortex cold gas flow is just a portion of the vortex flow. Due to a great difference between transmission and vortex cold gas mass-flows, the associated temperature drop in the transmission gas is practically unnoticeable.

The vortex system can be part of either a new or retrofitted pressure regulation station design. Since there is no limit to the vortex tube flow rate, the system is capable of taking the whole station flow.

The conceptual schematic of the VPRS with the vortex cooling duty dissipated into a nearby transmission line is shown in Fig.1. The vortex system here is retrofitted into an existing station equipped with the Line Heater. Upon installing the vortex system the shut-off valve at the Line Heater inlet is permanently closed.

Contact UVI with any of your heating or cooling needs.

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A Thermal Solution...

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The vortex system thermal performance is illustrated by the following example:
Input Data: Transmission gas/station inlet gas pressure and temperature are 850 psi and 40ºF, respectively. Gas delivery pressure is 150 psi. Vortex cold and vortex hot flows are split in 60% to 40% proportion.

Performance Data: The vortex cold and vortex hot flows actual temperature under these parameters are: -19ºF and 110ºF. The vortex cold flow temperature after its heat exchange with the transmission gas is 37ºF. The combined temperature of the vortex flows at the Station's discharge is 43ºF.

At the locations where there is no transmission line nearby and where an average winter temperature is above the vortex cold flow temperature, the vortex cooling duty can be dissipated into the ambient air. The concept can be applied at the Pressure Regulation Station with the existing Line Heater. At such stations the vortex heating will allow shutting down the Line Heater most of the winter; having it turned on only on very cold days.

At the location with a recipient facility in a close proximity to the VPRS, the cooling duty can be applied for industrial needs rather than to be dissipated into an external medium. The applications include process plants, LPG installations, cold storages, air conditioning of a nearby building etc. The cooling delivered via a glycol loop to the customer will generate revenue, in addition to the savings resulting from eliminating the Line Heater and its operational expenses.

The amount of energy generated at the VPRS and available to the utilities at no additional cost is illustrated by the following example: VPRS's flow rate 50 MMcfd, inlet and outlet pressure 750 psi and 150 psi, vortex cold flow is 50% of the station's flow. The cooling duty generated by the VT and available for industrial application is 1,750,000 BTU/hr or 146 ton of refrigeration.

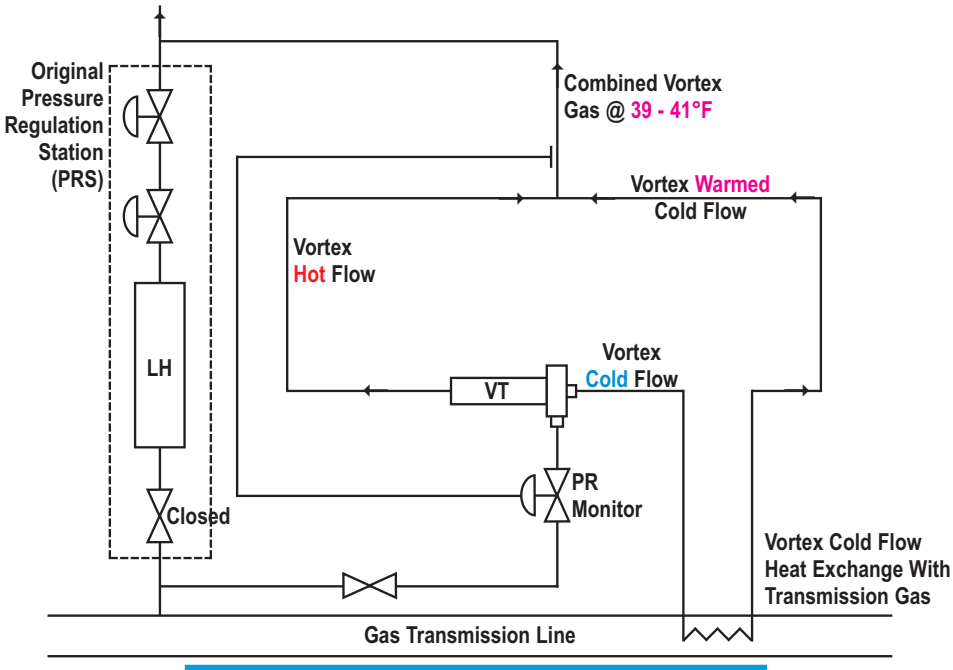

Figure 1 - Vortex Pressure Regulation Station

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