Engineering Bulletin

Bulletin: 014 / Venturi Op R007802

NOTE TO READER:

THESE INSTRUCTIONS / DATA DO NOT PURPORT TO COVER ALL DETAILS OR VARIATIONS IN EQUIPMENT NOR TO PROVIDE FOR EVERY POSSIBLE CONTINGENCY TO BE MET IN CONNECTION WITH INSTALLATION, OPERATION OR MAINTENANCE. SHOULD FURTHER INFORMATION BE DESIRED OR SHOULD PARTICULAR PROBLEMS ARISE WHICH ARE NOT COVERED SUFFICIENTLY FOR THE PURCHASER'S PURPOSES THE MATTER SHOULD BE REFERRED TO ELY ENERGY INC.

HOW A VENTURI SYSTEM OPERATES and WHAT LIMITS the SNG PRESSURES.

The venturi is named after an Italian physicist: **Giovanni Venturi**. He observed that when a fluid – *either a **gas like LPG** or a liquid*, is passed through a constricted channel, it will increase in **velocity. With SNG venturi systems, this occurs as LPG vapor** passes through the throat of the venturi nozzle. During venturi operation, the LPG is gaining **kinetic energy**.

Let's think for a moment though:

> Due to the **first law of thermodynamics** ("*Conservation of Energy*") kinetic energy must come from some place! It does not just "occur".
>
> If you look up the 1st Law of thermodynamics in a reference book you will learn that energy can be neither created nor destroyed. Energy, however, can be **converted** from one form to another. For example, ***potential energy*** *can be converted to* ***kinetic energy.*** But**,** ***total energy*** remains constant.
>
> In a venturi, kinetic energy increases as the LPG is accelerated. The "pressure" (energy) is reduced – and hence total energy again remains constant.
>
> The venturi creates what I have called "*negative pressure"* in the venturi chamber. Consequently, the atmospheric pressure is "*greater*" than the pressure in venturi housing. Air flows as we would expect, from the higher pressure zone (*atmosphere*) to the lower pressure zone (*into the venturi housing*) – to mix with the LPG.
>
> This is a simple explanation – but it describes the principle.

From the above it should also be apparent that the [1]most energy the atmospheric pressure can contribute is about (1) atmosphere or (14.7 PSIG). You will also notice that as the SNG pressure gets higher – the inlet pressure to our venturi (*the pressure from our pumpset)* must also increase! There are limits on what LPG pressures are feasible based on vaporization and pumping.

In summary, without using an air compressor or blower our venturis can provide:

A) **7 PSIG**$_{max}$ of SNG pressure if the LPG is ~ 50% butane and 50% propane (* *this can vary slightly*)
B) **12 PSIG**$_{max}$ of SNG pressure if the LPG is 100% propane
C) **6 PSIG**$_{max}$ of SNG pressure if the LPG is 100% butane

[1] Technically – this depends on elevation, etc. but for sake of this discussion this is adequate.

If we want to increase SNG pressure above these pressures with a venturi – we must increase the available AIR PRESSURE above atmospheric pressure. This requires use of an air compressor or blower.

PLEASE take the time to read and understand this. You MUST understand how a venturi operate.

Ely Energy manufactures a variety of Venturis of different capacities.

These are designed to **provide 6, 8, 10, or 12 PSIG – depending on the LPG feedstock**. We combine these venturis in combinations to achieve the specific capacity that is required.

Higher pressures are achieved using our air assisted venturis. On the air assisted models we **prefer** not to exceed **35 PSIG** for the discharge SNG pressure.