ISO9001:2015 REGISTERED

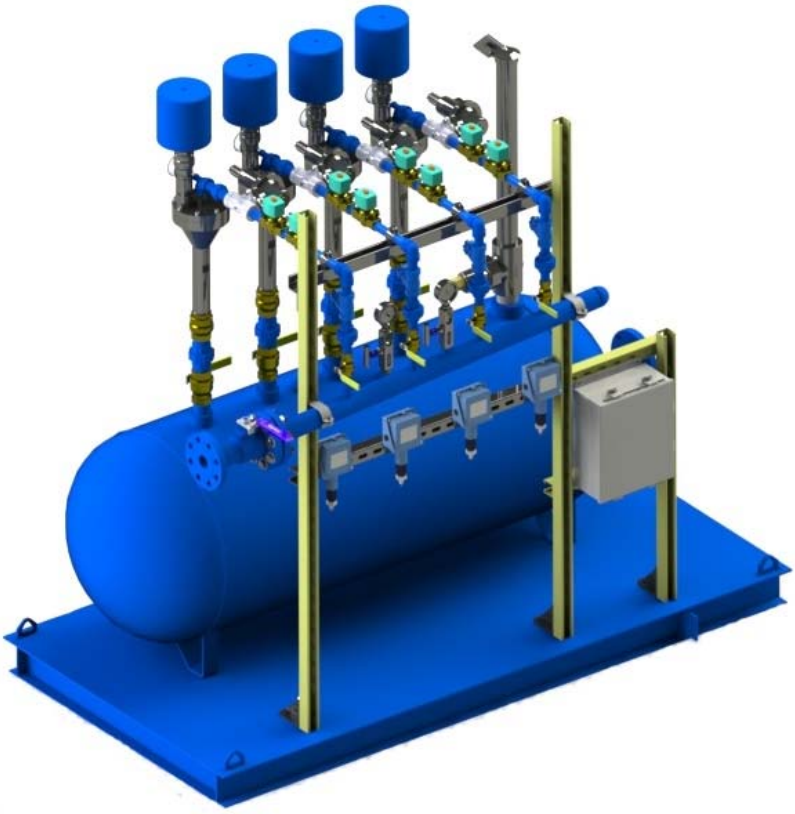
Alternate Energy Systems, Inc.

LPG Vaporizers - LP/Air Blenders - Gas/Gas Blenders - NatGas Backup Systems - PeakShaving Systems

UPDATE Feb 2019

LPG-Vapor / Air Mixing Systems

Venturi - Type



- **Capacities from 7 MMBTU/h to over 200 MMBTU/h**
- **Complete with Steel Skid, Controls, and Surge Tank**
- **Dual Solenoid Valves for each Venturi (Safety & Dynamic)**
- **For Standby or Base-load systems**
- **Replacement for existing, less reliable mixers**
- **Electro-Mechanical Switch Controls for smaller systems (up to 20 MMBTU/h; Compact Configuration)**
- **PLC Controls with touchscreen HMI for larger systems**
- **Also available as single-skid installation with vaporizer**

What are LPG-Vapor / Air Mixers ?

LPG vapor from a vaporizer or a storage tank is not directly compatible with natural gas and can therefore not be used for standby or backup purposes. LPG vapor/air blenders blend LPG vapor with air to produce a gas mixture that is directly compatible and interchangeable with natural gas. This allows users to switch back and forth between natural gas supplied by their utility company, and their own, LPG based backup fuel, without having to change the setup of any of their process or heating equipment, such as burners, boilers, heater, dryers, kilns, drum ovens, etc. The LP/air blend is often referred to as Synthetic Natural Gas, or SNG.

The most common vapor/air mixers are based on venturi tube mixing devices. AES uses the high pressure/high efficiency Hallberg Venturi Systems (HVS), generating gas pressures of up to 15 psi without the need of compressed air supply, making these systems very simple and economical to operate.

How do Alternate Energy Systems' HVS LPG-Vapor / Air Mixers work ?

HVS Systems are designed to be used with an existing LPG vapor source, such as a vaporizer, or as the replacement for less efficient or less reliable LPG-vapor/air mixing systems They come complete with steel skid, vapor inlet header, Venturi-type mixer arrangements, surge tank, electric/electronic controls, and all other equipment necessary for safe operation.

LPG vapor enters the vapor inlet header and then passes through a pressure regulator. From there, the pressure-adjusted vapor flows through the high precision nozzle and the Venturi tube section of the HVS into the surge tank. While the vapor passes through the tube section, the Venturi effect entrains a specific amount of ambient air through the air intake and check valve and sends the mixed gas into the surge tank, from where the mixed gas is drawn into distribution.

The amount of air mixed into the LPG vapor stream must be precisely controlled to make good SNG or NatGas Replacement. Most important for the compatibility of SNG with natural gas is the Wobbe Index, which is a measure of the interchangeability of two fuel gases.

$$\text{Wobbe Index} = \frac{\text{Gross Heat Value}}{\sqrt{\text{Specific Gravity}}}$$

Gases with similar Wobbe Index have similar energy transfer through a given orifice at a given pressure, allowing use of either fuel gas without changing the burner settings. The Wobbe Index of "standard" Natural Gas is 1291 (1000 BTU/cuft; S.G. = 0.6). Adjusting LPG/Air to a specific gravity of 1.3 yields a mixed gas with a very similar Wobbe Index (1480 BTU/cuft; S.G. = 1.3; WI = 1298), allowing changeovers from one gas to the other without any changes to the setup of the connected loads.

All HVS systems monitor the gas pressure in the surge tank. Increased demand on the system results in a momentary drop in tank pressure. In systems with three or more Venturi mixers, this drop is detected by a pressure transmitter which is connected to a PLC. In smaller systems, tank pressure is monitored by mechanical pressure switches. The PLC then activates (opens) the dynamic solenoid valve in the first Venturi mixer, which begins producing SNG. As the load increases, and tank pressure decreases further, additional Venturi mixers are activated, producing additional gas. Using electronic pressure transmitters rather than mechanical pressure switches allows the setpoints between activation pressures to be kept very close together, resulting in very little pressure fluctuations between no-load, partial-load, and full-load conditions in large systems.

The PLC in systems with three or more Venturi mixers not only sequences the Venturi lines, but also controls all other system functions. The PLC also communicates with a graphical user interface with touchscreen controls, indicating system pressures and any trouble conditions that may occur. The PLC may also be used to interlock the HVS system with an external vaporizer.

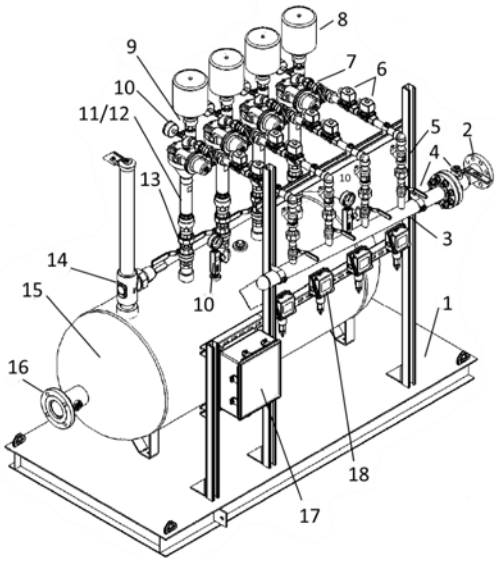
Size and configuration of the PLC, Display Unit, Pressure Transmitters, and other system components, varies with the size of the mixer and can easily be modified to meet almost any specific needs.

All HVS Mixers are equipped with two solenoid valves per Venturi train. The dynamic solenoid valve opens and closes each time a Venturi mixer is activated to produce SNG. The static solenoid valve opens when the mixer is started and stays open until the mixer is stopped, or until a high-pressure alarm occurs. This feature provides an additional level of safety and prevents the unwanted discharge of mixed gas in case of a failure of the dynamic solenoid valve.

Mixer HMI Controls

Standard on systems with 3 or more Venturi trains, optional for smaller/compact systems. Control panel is designed for installation away from HVS in non-hazardous, non-electrically-classified area.

When installed on the same skid as an AES Water Bath Vaporizer, Mixer and Vaporizer controls are integrated as shown at left.



1 Steel Skid
2 Vapor Inlet
3 Vapor Header
4 Ball Valve
5 "Y" Type Strainer
6 Solenoid Valve
7 Pressure Regulator
8 Air Intake
9 Check Valve
10 Pressure Gauge
11 Venturi Nozzle (not viz.)
12 Venturi Tube
13 Check Valve
14 Relief Valve
15 Surge (Receiver) Tank
16 MixGas Outlet
17 On-Skid Control Panel
18 Pressure Switch
19 PLC (not shown)
20 Display Unit (not shown)
21 Pressure TXer (not shown - replaces Switches)

Features and Specifications

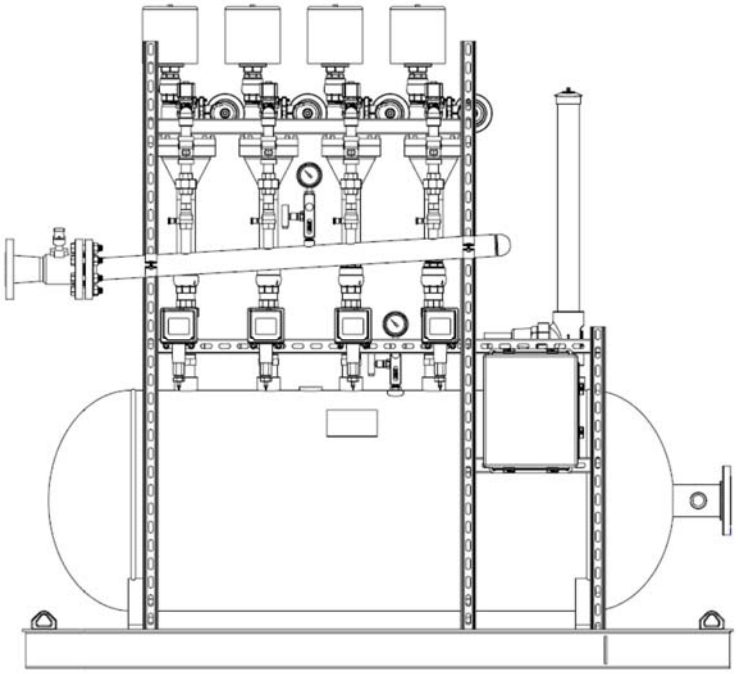
Model Number	Nominal Capacity[1] in MMBTU/h 5 to 8 psi & High Pressure Up to 15 psi	Number of Venturi Arrangements[2] 5 to 8 psi	Surge Tank Capacity US-gal (liter)	Vapor Inlet Connection	Mixed Gas Surge Tank Connection	Approximate Skid Size in Inches (m) W x L x H	Approximate Shipping Weight lbs (kg)
HVS - 7 MM	7	1	120 (450)	3/4-inch FNPT	3-inch FNPT	W = 36 (0.91) L = 68 (1.73) H = 68 (1.73)	600 (275)
HVS - 10 MM	10	1	120 (450)				600 (275)
HVS - 14 MM	14	2	120 (450)				650 (300)
HVS - 20 MM	20	2	120 (450)				650 (300)
HVS - 30 MM	30	3	120 (450)	2-inch 300# Raised Face Flange	4-inch 150# Raised Face Flange	W = 65 (1.65) L = 102 (2.59) H = 70 (1.78)	1000 (450)
HVS - 40 MM	40	4	120 (450)				1050 (475)
HVS - 50 MM	50	5	250 (950)				1100 (500)
HVS - 60 MM	60	6	250 (950)				1150 (525)
HVS - 70 MM	70	7	250 (950)				1200 (550)
HVS - 80 MM	80	8	500 (1875)	3-inch 300# Raised Face Flange	6-inch 150# Raised Face Flange	W = 65 (1.65) L = 128 (3.25) H = 80 (2.03)	1800 (825)
HVS - 90 MM	90	9	500 (1875)				1850 (850)
HVS - 100 MM	100	10	500 (1875)				1900 (875)
HVS - 110 MM	110	11	500 (1875)				1950 (900)
HVS - 120 MM	120	12	500 (1875)			Component layout and skid sizes for systems with nominal capacities of 120 MMBTU/h or larger are custom-designed to fit the locally available space. Please contact AES to discuss your specific situation and for weights and dimensions.	
HVS - 130 MM	130	13	500 (1875)				
HVS - 140 MM	140	14	1000 (3800)	4-inch 300# Raised Face Flange	8-inch 150# Raised Face Flange		
HVS - 150 MM	150	15	1000 (3800)				

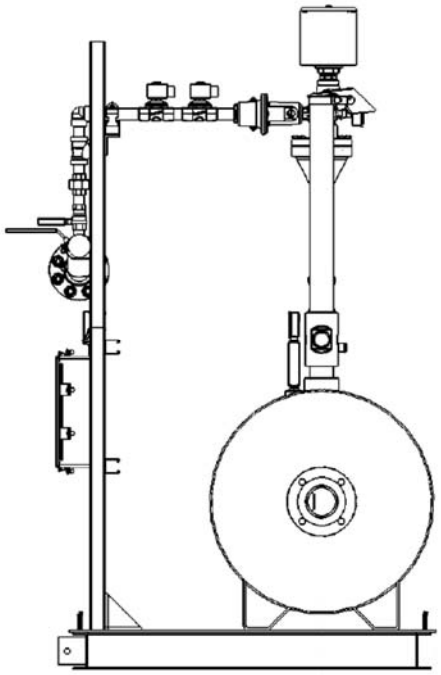
[1] Nominal Capacity for majority Propane LPG & Naturally-aspirated Venturi Arrangements.
[2] Actual number of Venturi arrangements may vary with desired mixed gas pressure.
All weights and dimensions are approximate. All Specifications are subject to change without notice.

	HVS-7MM	HVS-10MM	HVS-14MM	HVS-20MM	HVS-30MM	HVS-40MM	HVS-50MM	HVS-60MM	HVS-70MM	HVS-80MM	HVS-90MM	HVS-100MM	HVS-110MM	HVS-120MM	HVS-130MM	HVS-140MM	HVS-150MM
Electrical Requirements	AC 110 V / 60 Hz / 1-phase / 15 A or less (Export: AC 220 V / 50 Hz / 1-phase / 15 A or less)																
Low Vapor Pressure Switch	S	S	S	S	–	–	–	–	–	–	–	–	–	–	–	–	–
Venturi Control, Pressure Switch 1	S	S	S	S	–	–	–	–	–	–	–	–	–	–	–	–	–
Venturi Control, Pressure Switch 2	–	–	S	S	–	–	–	–	–	–	–	–	–	–	–	–	–
High/Low Mixed Gas Pressure Switch	S	S	S	S	–	–	–	–	–	–	–	–	–	–	–	–	–
Standard Electro-Mechanical Controls	S	S	S	S	–	–	–	–	–	–	–	–	–	–	–	–	–
Rosemount Pressure Transmitter for High/Low Vapor Alarms	O	O	O	O	S	S	S	S	S	S	S	S	S	S	S	S	S
Rosemount Transmitter; for Venturi Control and High/Low MixGas Alarms	O	O	O	O	S	S	S	S	S	S	S	S	S	S	S	S	S
Programmable Logic Controller (Siemens S7 or Allen-Bradley MicroLogix)	O	O	O	O	S	S	S	S	S	S	S	S	S	S	S	S	S
Graphical User Interface w/ Touchscreen (Weintek)	O	O	O	O	S	S	S	S	S	S	S	S	S	S	S	S	S

S = Standard Equipment O = Optional Equipment All specifications are subject to change without notice.

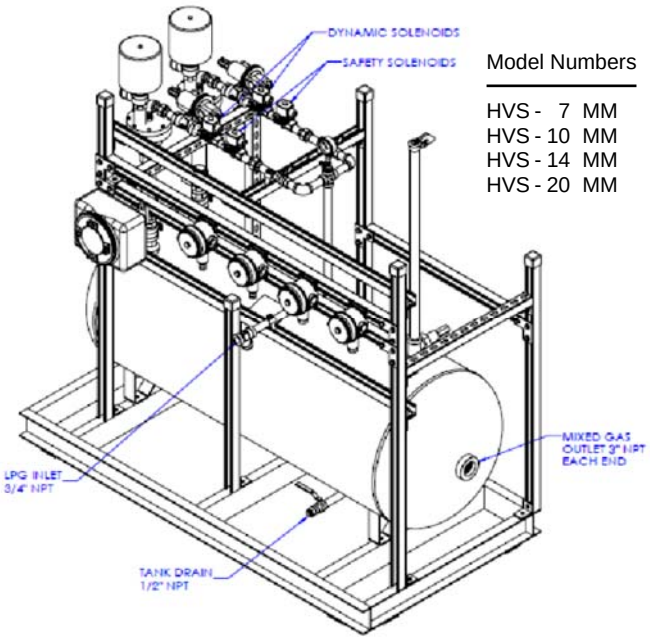
Drawings





Model Numbers

HVS - 30 MM
HVS - 40 MM
HVS - 50 MM
HVS - 60 MM
HVS - 70 MM
HVS - 80 MM
HVS - 90 MM
HVS - 100 MM
HVS - 110 MM



Model Numbers

HVS - 7 MM
HVS - 10 MM
HVS - 14 MM
HVS - 20 MM

Dimensions	L	W	H
HVS - 7 MM HVS - 10 MM HVS - 14 MM HVS - 20 MM	68" (1.73 m)	36" (0.91 m)	68" (1.73 m)
HVS - 30 MM HVS - 40 MM HVS - 50 MM HVS - 60 MM HVS - 70 MM	102" (2.59 m)	65" (1.65 m)	70" (1.78 m)
HVS - 80 MM HVS - 90 MM HVS - 100 MM HVS - 110 MM	128" (3.25 m)	65" (1.65 m)	80" (2.03 m)

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