

Global Leader In SNG Energy Systems

(Synthetic Natural Gas)



AFC™ SNG Blender Series



Ely 
Energy

Get what you deserve...

SNG consumers demand gas quality regardless of their flow profile. They demand an SNG blender equipped as standard with the critical safety and control functions available to them. These include Auto-Ratio-Control, Class 1 Division 1 Group D location suitability, flow meters to understand gas and air flows, pressure transmitters to understand their pressures and an HMI for ease of operation.

The AFC™ provides what you demand – and more!



A fully packaged, intelligent system designed to replace all existing mixing technologies

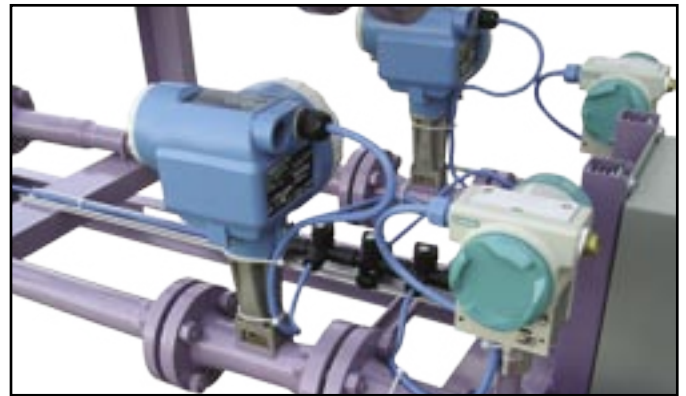
Mix with intelligence

AFC™ stands for Active Flow Control. In conventional “feedback only” blenders, poor gas quality is identified too late. Heat sensitive products, particularly glass, ceramics or food can be ruined by poor gas quality. The potential costs can be enormous. For SNG systems serving residences in a CityGas application, the concerns for gas quality are even more stringent. Why take a risk...

The AFC™ eliminates “after the fact” problems. The AFC™ utilizes a combined “feed-forward” and “feedback” control strategy. The intelligent control system pre-determines, *instantaneously*, the appropriate position of the air flow control valve to provide the correct air to LPG ratio. Simultaneously, actual air flow through the blenders air meter is compared with the calculated air flow required to the exact air to LPG ratio. The AFC™ performs this fine tuning perfectly and instantly.... The AFC™ has a process response cycle time of 600 milliseconds compared to 5 minutes or more in the case of conventional blenders using only a feedback signal!

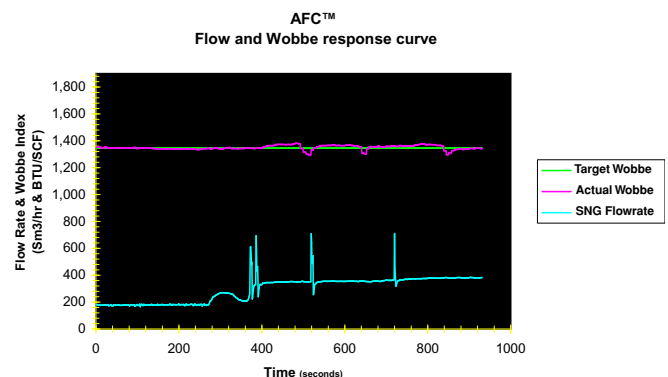
Feed Forward Control Advantages

Only the AFC™ delivers an accurate LPG-air mix immediately upon start-up and under rapid load changes. When the AFC™ is started, the LPG flow meter sends a flow value to the control system. The control system responds instantaneously and pre-determines the position of the air flow control valve relative to the LPG vapor flowrate. Within seconds, the actual measured air flow rate is compared with the calculated flow rate and the control system makes the necessary adjustments. The AFC™ is now on line. Perfect gas quality — no wild swings and no “bad gas” typical of old conventional mixing systems.



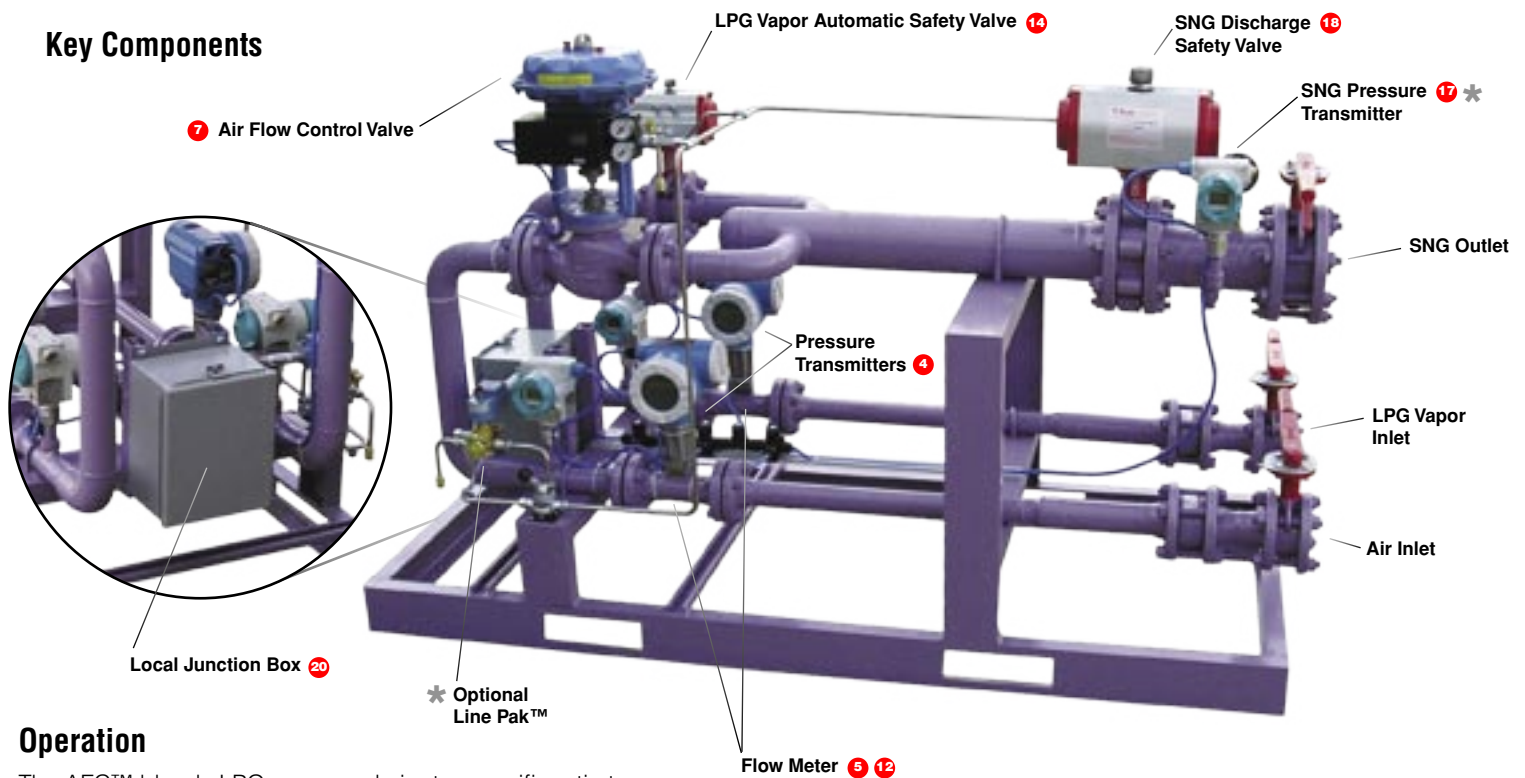
Profibus™ PA Instrumentation

At low SNG flow rates, conventional mixing systems have “turndown problems.” The typical solution is to manually turn off the mixing system, manually adjust the regulator pressures to a lower setting and then manually restart the mixing system. The customer then operates the system at this lower SNG discharge pressure —until there is a need to increase flow again. The AFC™’s **Line Pak™** option allows pressure and flow parameters to be pre-set in the Control System. Mixing with intelligence, the AFC™ automatically closes the mixed gas outlet valve and then automatically reopens it at a lower down-stream pressure! No manual steps required and the concern of “turn-down” is eliminated!



Graph illustrates the accuracy of the Actual Wobbe value versus the Target Wobbe value and the rapid correction of the Wobbe value when an SNG flow rate change occurs.

Key Components

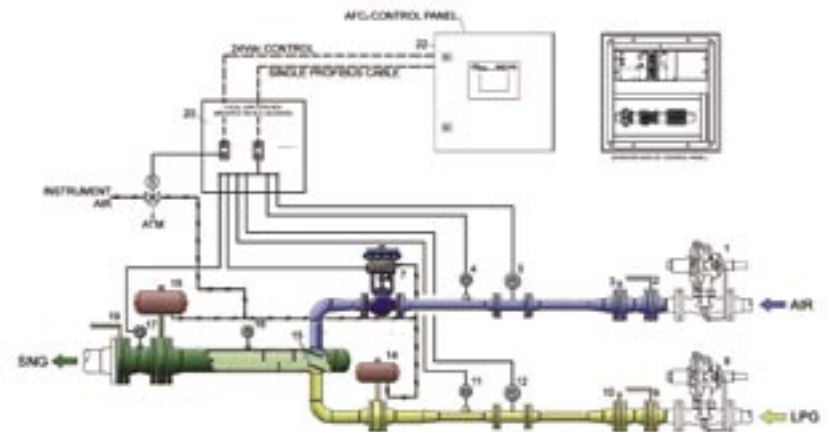


Operation

The AFC™ blends LPG vapor and air at a specific ratio to perfectly simulate the combustion characteristics of natural gas. Pressure and temperature compensated flow meters, as shown in the schematic, measure the regulated flow of LPG and air. The volumetric flow of both gas streams are converted to their true molar values with a sophisticated gas flow algorithm that takes into account the system pressures, temperatures and compressibility factors. The ratio of the two flow rates is then compared to the calculated air to LPG ratio required for the Wobbe Index of the natural gas being simulated.

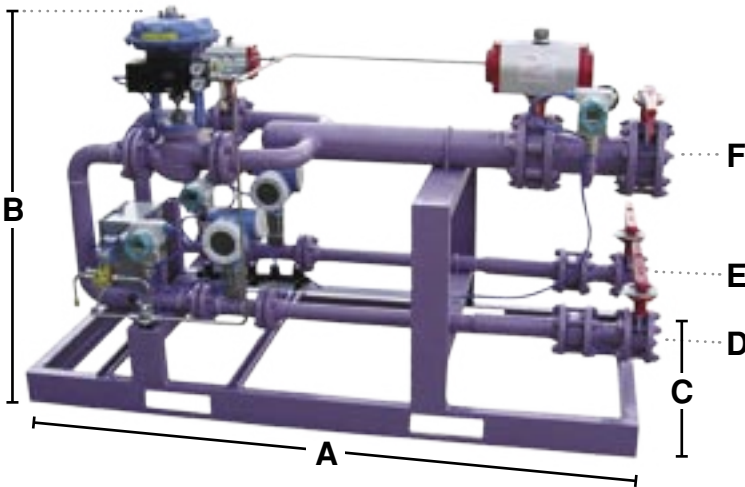
Adjustments to the ratio are made only on the air side of the system. Adjustments are automatic and are performed by the Air Flow Control Valve. As the flow of SNG either increases or decreases, the Air Flow Control Valve modulates and maintains an exact and constant mixing ratio between the LPG and air streams. The result is a Wobbe value that typically varies $< \pm 1\%$. Manual or automatic adjustments of the mixing ratio are performed from the touch screen of the HMI (Human Machine Interface) of the AFC™.

Pressure regulators installed upstream of the AFC™ maintain constant pressure to both the vapor and air inlets. Therefore, the AFC™ responds much like a traditional regulator. When providing SNG in a piped network, as the gas distribution pressure decreases, the SNG flow rate will increase to maintain pressure. Likewise, when the gas distribution pressure rises, the SNG flow decreases. The LPG vapor regulator establishes the AFC™ discharge pressure.



- 1 8 Pressure Regulators** (Not provided)
- 2 9 Butterfly-type Isolation Valve**
- 3 10 Wafer-type Back Flow Check Valve**
- 4 11 Pressure Transmitters** (Pressure correction of the flow data)
- 5 12 Flow Meters** (With temperature compensation)
- 7 Air Flow Control Valve** (Controls air flow based on flow and control parameters)
- 14 LPG Vapor Automatic Safety Valve** (Pneumatically opens - spring close; Valve closes when there is a safety violation)
- 15 Turbulators** (Internal to header)
- * SNG Pressure Transmitter** (Used only with Line Pak™ option)
- 16 Pressure Indicator** (Displays mixed gas discharge pressure)
- 17 Pressure Transmitter** (Provides mixed gas discharge pressure signal to the control system)
- 18 SNG Discharge Safety Valve** (Pneumatically opens – spring close; Valve closes when there is a safety violation)
- 19 Butterfly-type Isolation Valve**
- 20 Local Junction Box** (Mounted on the AFC™ Blender)
- 21 Profibus Cable** (Single cable link from the AFC™ Junction Box to the Control Panel)
- 22 Control Panel** (Simple 'Touch Screen' design; Operator-friendly and compact)

Dimensional Data:



All dimensions in imperial and metric units	Flange Types		
	LPG = 150#RF	Air = 150#RF	SNG = 150#RF

AFC™ MODEL DATA							
MODEL		A	B	C	D	E	F
A2	Ft./In	6'-0"	2'-6"	1'-6"	2"	2"	4"
	mm	1829	762	457	150#RF	150#RF	150#RF
A3	Ft./In	6'-0"	2'-6"	1'-6"	2"	2"	4"
	mm	1829	762	457	150#RF	150#RF	150#RF
A4	Ft./In	7'-0"	3'-3"	2'-1"	3"	3"	6"
	mm	2134	991	635	150#RF	150#RF	150#RF
A5	Ft./In	7'-6"	3'-3"	2'-1"	4"	4"	6"
	mm	2286	991	635	150#RF	150#RF	150#RF
A6	Ft./In	9'-6"	4'-0"	2'-6"	6"	6"	8"
	mm	2896	1219	762	150#RF	150#RF	150#RF
A7	Ft./In	12'-6"	4'-2"	2'-6"	8"	8"	10"
	mm	3810	1270	762	150#RF	150#RF	150#RF
A8	Ft./In	Contact Factory for Sizing and Dimensions					
	mm						
Dimensions are not certified							

AFC™ CAPACITY GUIDE

CAPACITIES BASED ON HD5 PROPANE

MODEL

DISCHARGE		A2		A3		A4		A5		A6		A7		A8	
PSIG	Mpa	MMBTU/h	NM ³ /h	MMBTU/h	NM ³ /h	MMBTU/h	NM ³ /h	MMBTU/h	NM ³ /h	MMBTU/h	NM ³ /h	MMBTU/h	NM ³ /h	MMBTU/h	NM ³ /h
20	0.14	28	536	70	1317	116	2196	261	4928	452	8537	1029	19419	CONTACT FACTORY	
30	0.21	36	674	88	1657	146	2764	329	6202	569	10742	1294	24437		
40	0.28	43	813	106	1998	176	3331	396	7475	686	12948	1560	29455		
50	0.35	50	951	124	2338	207	3899	463	8748	803	15154	1826	34473		
60	0.41	58	1090	142	2678	237	4466	531	10022	920	17360	2092	39491		
70	0.48	64	1217	158	2991	264	4987	593	11191	1027	19385	2336	44096		
80	0.55	71	1341	175	3297	291	5498	654	12338	1132	21372	2575	48618		
90	0.62	78	1464	191	3598	318	6000	713	13464	1235	23324	2810	53057		
100	0.69	84	1584	206	3894	344	6493	772	14571	1337	25240	3041	57416		
110	0.76	90	1702	222	4184	370	6978	829	15657	1437	27122	3268	61697		
120	0.83	96	1818	237	4170	395	7453	886	16724	1534	28971	3491	65902		
130	0.90	102	1932	252	4750	420	7921	941	17773	1631	30787	3709	70034		

CAPACITIES BASED ON 40% BUTANE / 60% PROPANE

20	0.14	33	606	80	1490	134	2484	300	5574	520	9655	1183	21963	CONTACT FACTORY	
30	0.21	40	748	99	1839	165	3067	371	6881	642	11920	1460	27116		
40	0.28	48	882	117	2168	195	3615	437	8111	757	14050	1721	31961		
50	0.35	55	1017	135	2500	225	4169	504	9354	873	16204	1985	36861		
60	0.41	62	1144	152	2813	253	4690	567	10525	982	18231	2233	41473		
70	0.48	69	1278	169	3142	282	5240	633	11757	1097	20366	2495	46329		
80	0.55	75	1398	185	3436	309	5729	692	12855	1199	22268	2728	50655		
90	0.62	82	1526	202	3751	337	6255	756	14035	1309	24313	2978	55307		
100	0.69	89	1652	219	4061	365	6772	818	15196	1417	26322	3224	59878		
110	0.76	96	1776	235	4366	392	7280	880	163361	1524	28298	3466	64373		
120	0.83	102	1898	251	4666	419	7780	940	17458	1628	30241	3704	68792		
130	0.90	109	2018	267	4960	445	8271	999	18560	1731	32151	3938	73137		

• The final sizing to be confirmed by Ely Energy Factory and may vary from "typical" sizing shown above
 • Dimensions are non-certified and not for engineering or design use
 • Product improvement is a continuing goal at Ely Energy. Design and specifications are subject to change without notice

Intelligent Instruments:

- IEC61158-2 digital fieldbus communication is standard
- No analog scaling errors or drift:
 - All data transmitted directly to the PLC via digital fieldbus
 - Values transmitted directly in 32-bit floating-point format; eliminates scaling errors
- Advanced diagnostic information:
 - Process values transmitted with a diagnostic byte to indicate signal quality
 - Alarms triggered when signal quality is questionable, no guess work!
- Integrated explosion-proof protection:
 - Instruments are bus powered via Zone 0, Ex ia power supply

Robust flow measurement:

- Immune to:
 - Vibration to over 1 g in all axis
 - Thermal shock > 150 K/s
 - Dirty media
- Permanent self-monitoring and diagnostic of electronics and sensor.
- No maintenance
 - No moving parts
 - No zero-point drift on flow sensor

True digital flow control valve positioning:

- Robust piezoelectric valve block is virtually wear proof
- Minimum air consumption required by piezoelectric valves
- One touch, "push button" self-tuning of valve positioner
- Local display of controller set-point and actual valve position
- Extended diagnostic information (e.g. positioner will even report lack of instrument air!)



Standard Blender Evaluation	Manufacturer		
	Ely Energy AFC™	Mfg. X	Mfg. Y
<i>(Standard features on base unit)</i>			
<i>Class 1 Division 1 Group D Suitable</i>	YES	YES	NO
<i>Auto Ratio Control</i>	YES	NO	NO
<i>LPG Pressure Transmitter</i>	YES	NO	NO
<i>Air Pressure Transmitter</i>	YES	NO	NO
<i>Touch Screen</i>	YES	NO	NO
<i>Optional Voltage</i>	YES	NO	NO
<i>LPG Flow Measurement</i>	YES	NO	NO
<i>Air Flow Measurement</i>	YES	NO	NO
<i>SNG Flow Measurement</i>	YES	NO	NO
<i>Feed Forward and Feed Back Control</i>	YES	NO	NO
<i>Profibus® communication</i>	YES	NO	NO
<i>No wiring on skid!</i>	YES	NO	NO
<i>Design eliminates use of "mixing valve"?</i>	YES	NO	NO
<i>Design eliminates chance of sticking piston?</i>	YES	NO	NO
<i>Only one cable from Control Panel to Blender</i>	YES	NO	NO
<i>Can achieve flow rates of AFC™</i>	YES	NO	NO
<i>Can achieve operating pressure of AFC™</i>	YES	NO	NO
Score	17 pts	1 pt	0 pts

AFC™ or the other brand? You decide...

Intelligent process control:

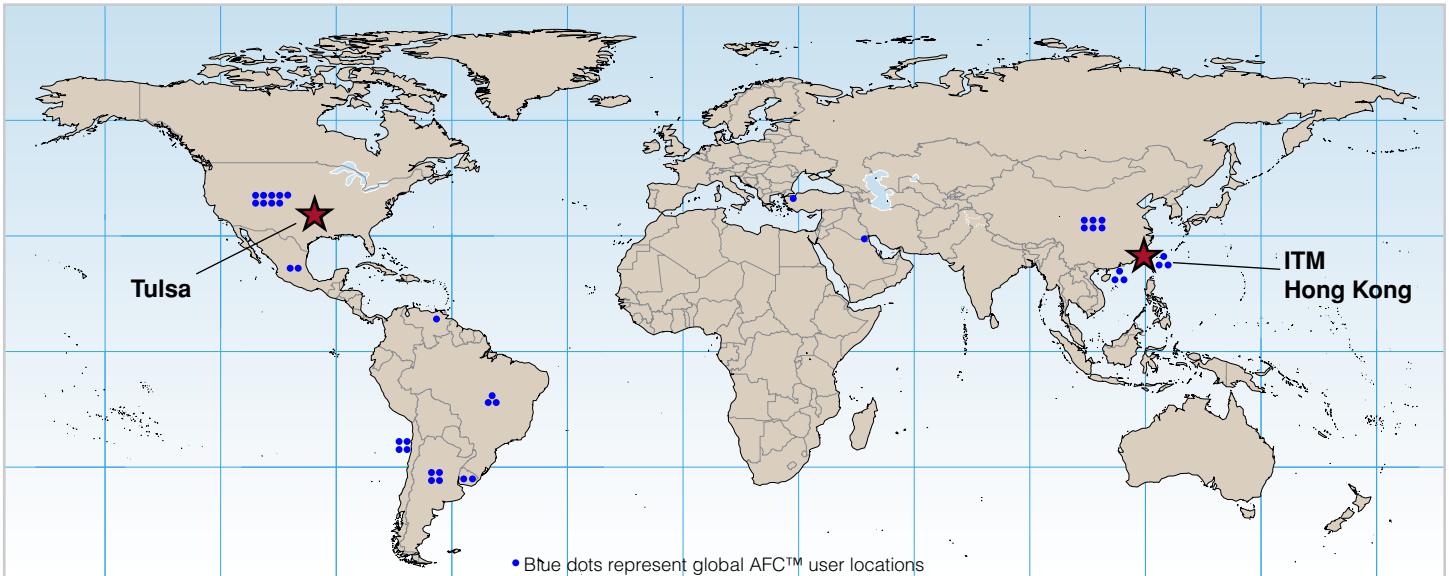
- Automatic calculation of mixing ratio set-point to achieve the target Wobbe Index
- Automatic Ratio Adjustment when an optional Wobbe Index meter is used
- Adjustable alarm set-points and process response via HMI screens
- Alarm messages with process value stamps
- Extensive process value display for process diagnostics:
 - For each flow stream the AFC™ can display:
 - Real-time pressure
 - Real-time temperature
 - Real-time actual flow
 - Real-time corrected flow at standard conditions
 - Totalized flow at standard conditions
 - Real-time molar flow
 - Real-time gas stream velocity
 - Real-time compressibility factor
 - Real-time gas density
 - Real-time volumetric ratio
 - Real-time molar ratio
 - Mixed gas pressure (available with Line-Pak™ optional)
 - Mixed gas totalized flow at standard conditions
 - Control valve throttle position
 - Real-time Wobbe Index of mixed gas
- Communication interfaces available:
 - RS-232 (ASCII, 3964R)
 - RS-485 (MPI, Profibus, Modbus, DF1, DH485)
 - Ethernet (TCP/IP, Http, FTP, Web, OPC)

From 1898 to the 21st Century....

Ely Energy's origin dates to 1898 when Energy Systems, Inc. (ESI), a company later acquired by Ely Energy, began as a mechanical contractor in Minnesota (USA). By the 1950's ESI had branched out into associated mechanical engineering activities that grew to include the design and manufacture of Synthetic Natural Gas (SNG) systems. In 1980 ESI was acquired by the RJ Ely Company of Tulsa, Oklahoma (USA) and began operations as Ely Energy Systems, and later as Ely Energy Inc., a subsidiary of the RJ Ely Company. In 1998, under a corporate consolidation, the corporation formerly changed to Ely Energy, Inc. (EEI)

Today **Ely Energy** is an expanding, diversified designer and manufacturer of high quality process equipment for the global environmental, power and process markets.

ITMation™ Ltd. (ITM) is a Hong Kong based partner of Ely Energy. ITM™ specializes in automation, process controls and providing innovative solutions to industrial and utility needs.



Other Products:



STABILIZER™ LPG Pump Set



STEAM-FLO™ SV Series Vaporizer



Wobbe Index Meter (WI/A)

AFC™ is a trademark of ELY Energy, Inc.

Ask for your free "Ely Energy Corporate Profile"



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