

# CleanCNG

by  **Clean Energy<sup>®</sup>**



## **STANDARDIZED, MODULAR AND SCALABLE**

Streamlined, modular engineering improves initial specification, quicker delivery time, and lower prices on standard equipment.

## **REDUNDANCY & RELIABILITY**

Available in twin or tri-compressor integrated systems for efficient flexibility and mission-critical redundancy.

## **LOW NOISE OPERATION**

Engineered for low noise and vibration, making the CleanCNG<sup>™</sup> suitable for even residential neighborhood installations.

## **CLEANEST FUELS**

Non-lubricated compressors produce CleanCNG<sup>™</sup> with the lowest oil carry-over which reduces fleet maintenance, cost of operation, and extends vehicle engine life.

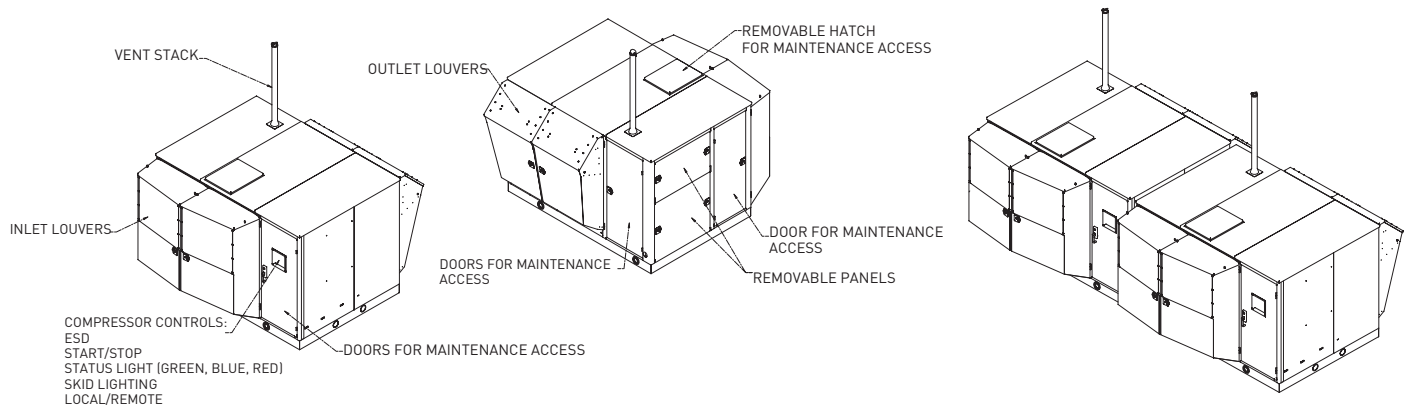
Clean Energy Compression's compressors are among the most versatile natural gas compressors on the market today. Fully integrated CNG fueling systems are designed, manufactured, packaged, and tested by Clean Energy Compression's in-house engineering and production teams, using standard models and custom equipment designs.



# The CleanCNG™ Compressor is a Significant Leap Forward for the CNG Industry

While building on one of the most reliable and proven compressors, Clean Energy Compression continuously examines how to improve quality and reduce costs at each phase for the owner and end-user. From site footprint usage,

product specification, installation, scalability, portability to reducing maintenance intervals, and downtime; the CleanCNG™ delivers reliable performance, peace of mind, and affordability for station owners.



## FEATURES & BENEFITS

### SERVICEABILITY

- Service pathway for easy access
- Multiple access panels
- Standardized service connection panel
- “Slide-out” heat exchangers for easy access and inspection
- Access key service items directly from service doors
- Direct access to grouped pressure relief valves
- Complete compressor access via swing-away inlet louvers
- Lockout valves on recovery tank and PSV for easy, vent free servicing

### ULTRA-LOW NOISE AND VIBRATION

- The CleanCNG™ offers less than 75 dBA @ 3m, revolutionary in the CNG industry \*Standard
- Vibration measurements meet or exceed recommended industry guidelines

### ACTUATION OPTIONS

- Option for Gas or Air actuated valves

### LOWEST OIL CARRY-OVER

- Non-lubricated compressors produce high-quality CNG through the use of self-lubricating piston rings and rod packings
- The CleanCNG™ delivers exceptionally clean oil carry of less than 5 parts per million.
- The CleanCNG™ produces the cleanest downstream gas, avoiding oil build-up and ensuring cleaner combustion at the vehicle

### ESSENTIAL FEATURES

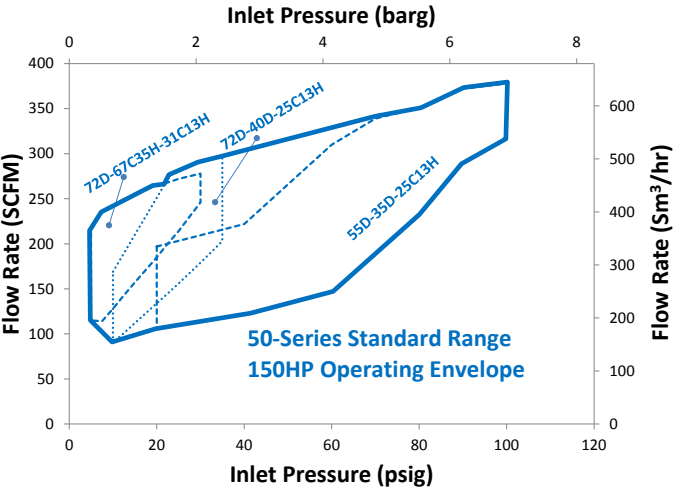
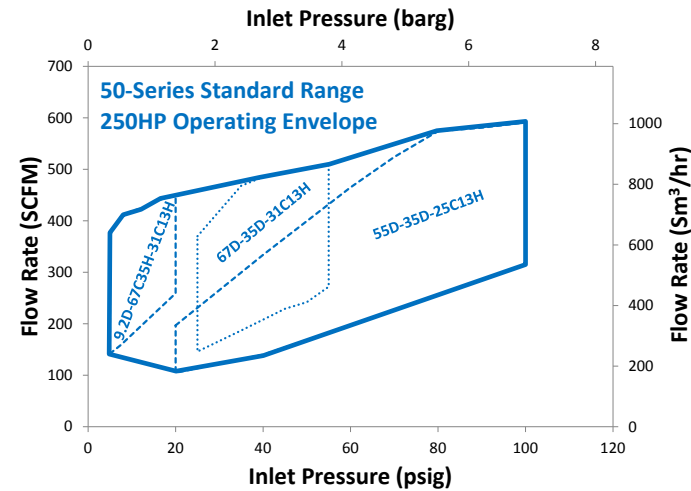
- Non-lubricated cylinders, pistons, and valves for clean discharge gas (5ppm or less oil carryover)
- Balanced reciprocating design for low vibration and low noise
- Compressor layout designed for easy service
- Electrical control (PLC/MCC panel with alarm status indicators for unattended operation)
- Self-lubricating Teflon and/or PEEK composite piston rings and rod packing
- High efficiency gas-to-air heat exchanger for inter-stage and discharge gas cooling

TECHNICAL

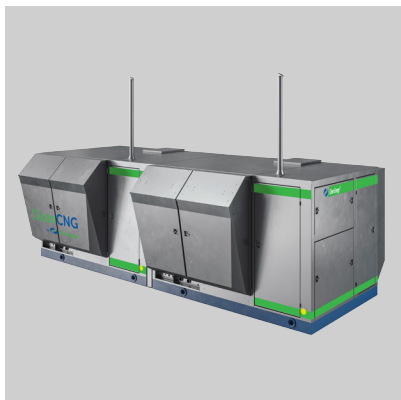
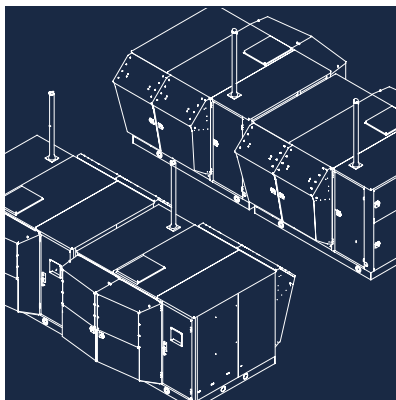
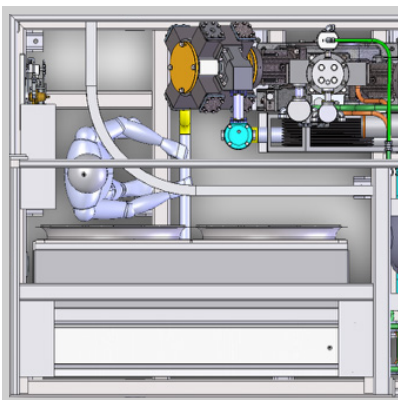
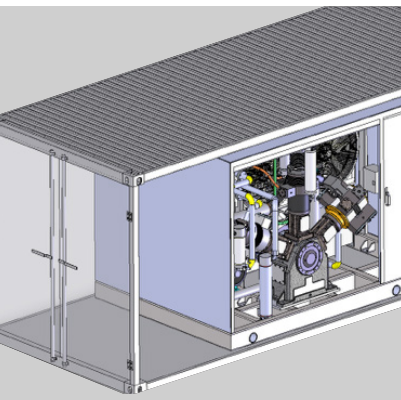
CONFIGURATION		MODULAR SINGLE SUITABLE FOR CONTAINERIZED SHIPPING	
SKID FOOTPRINT (CONTACT AREA BETWEEN SKID & CONCRETE)		10'6" L X 7'4" W(3.2M L X 2.2M W)	
ENCLOSURE DIMENSIONS		10'6" L X 11'6" W X 7'3 H (3.2M L X 3.5M W X 2.2M H)	
WEIGHT		17000 LBS (7711 KG)	
NOISE LEVEL		<74DBA @3M, 1M HEIGHT	
GAS LINE CONNECTIONS	INLET	2" (5CM) NPS & 3" (7.6CM) NPS	
	DISCHARGE	¾" (2CM), 1" (2.5CM) TUBE CONNECTIONS	
SKID ELECTRICAL CLASSIFICATION		C1D1 & C1D2	
MCC PANEL ELECTRICAL CLASSIFICATION		NON-HAZARDOUS	
MCC PANEL LOCATION		OFF-SKID	
MAIN MOTOR POWER		150HP (112KW), 250HP (187KW), AND 300HP (224KW) STANDARD/ 100HP (75KW), 200HP (150KW) OPTIONAL, VFD OPTIONAL	
HIGH VOLTAGE ELECTRICAL SUPPLY	50HZ COUNTRIES	50HZ   380-400 VAC   120/200V	
	60HZ COUNTRIES	60HZ   380-400/460-480/575-600 VAC   120/200V	
PRIORITY PANELS		OFF-SKID, ON-SKID OPTION FOR INTERNATIONAL MARKET	
CODE COMPLIANCE		ANSI, ASME, NFPA, UL, CSA	
ELEVATION RANGE		0-2000M (0-6600 FT)	
AMBIENT RANGE	STANDARD	-20°F – 113 F	-29°C – 45°C
	COLD WEATHER PACKAGE	-40°F – 113 F	-40°C – 45°C

- Measurements dependent on environmental conditions.
- Vertical air discharge louver. Sound measurement results are considered approximate and specific to the Clean Energy Compression factory measurement location as they may vary due to acoustic variables at the final installation site. Clean Energy Compression is not responsible for sound measurement results at the installation site and any specific sound abatement requirements are the responsibility of the client.
- Metric conversions given for reference only.
- Not all codes will be applicable for all projects,please refer to Clean Energy Compression for additional details on design codes.
- Gauge pressure at 0m elevation (1.01325 Bar).
- At 70°F Inlet Gas, 80°F ambient gas temperature conditions.

		MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
	POWER	100HP (75KW)				150HP (112KW)				250HP (187KW)				300HP (224KW)					
DISCHARGE PRESSURE	PSIG	3625				3625				3625				3625					
	BARG	250				310				250				310					
# OF STAGES		3	4	2		4	5	3	4	4	5	3	4	4	5	3	2	5	
INLET	PSIG	10	261	290	2900	10	130	10	261	5	150	23	696	5	250	232	290	3	1000
	BARG	0.7	18	20	200	0.7	9	0.7	18	0.3	10.3	1.6	48	0.3	17.2	16	20	0.2	69
FLOW RATE	SCFM	82	356	177	2429	84	269	119	548	127	429	343	1472	244	863	871	1093	269	1985
	DGE/H	35	151	75	1027	36	114	50	232	54	181	145	623	103	365	368	462	114	840
	NM^3/H	132	572	284	3903	135	432	191	881	204	689	551	2366	392	1387	1400	1756	432	3190
	SM^3/H	139	604	299	4119	142	456	202	929	215	728	582	2497	414	1464	1477	1854	456	3367



# CleanCNG™ DESIGN FEATURES



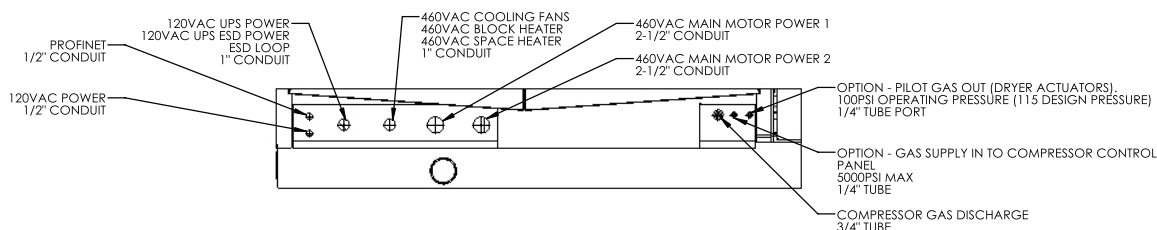
## IMPROVED DELIVERY OPTIONS

### SHIPMENT VIA CONTAINER

- Package designed to fit in standard 20ft shipping container
- Inlet and Discharge Louvers are easily removable

### SKID EDGE GAS CONNECTION

- Always in the same place for ease of site pre-plan/build and fast, convenient installation



## TECHNICIAN-FRIENDLY SERVICEABILITY

### VERTICAL INTER-STAGE COOLER DESIGN

- Easy access to each cooler section by opening discharge louver doors. Cooler section shelving design allows service technician to slide each section out individually to service.
- Cooler section removal with a single technician on-site in significantly less time.

### CENTRALIZED DRAIN LOCATION

- Drain lines fed to package front; easy drain check.

### FRONT ACCESS OIL SIGHT GLASS

- Easily visible, front-mounted oil sight glass for rapid evaluation of crankcase oil level.

### BUILT-IN MULTI-FUNCTION SERVICE CRANES

- Conveniently located cranes to service the CBA, cooler sub-assembly, and recovery tank. Modular and reconfigurable to meet variety of lifting requirements within the enclosure. Hide-away when not in use. Reduces risk of handling of heavy components per OSHA recommendations.





## TECHNICIAN FRIENDLY SERVICEABILITY

### MODULAR SCALABILITY

#### MODULAR DESIGN

- CleanCNG™ units connect with no required spacing to minimize skid footprint

### CONTROL SYSTEMS

#### ELECTRICAL HARNESS DESIGN

- Standardized approach to harness to reduce electrical installation cost.

#### ELECTRICAL CONTROL PANEL INSIDE ENCLOSURE

- Easy access to indoor control panel removes inclement weather concerns during servicing.

#### GLOBAL & LOCAL MODE CONTROLS LOGIC

- Several daisy-chained units are controlled via MCP (Global Mode).
- In the event of a fault with MCP (such as lost communication, fault, etc.) Each compressor package automatically switches to local operation mode, providing site redundancy.

- Modular design can expand with bridging kits as large as requirements demand. now or in the future

#### INTELLIGENT DUAL FAN LOGIC

- Cooler section air fan controls reduce dual fan to single fan operation based on inter-stage, discharge, and ambient temperature measurement to reduce operating noise and improve efficiency.

#### BUILT-IN DATA-LOGGING CAPABILITY

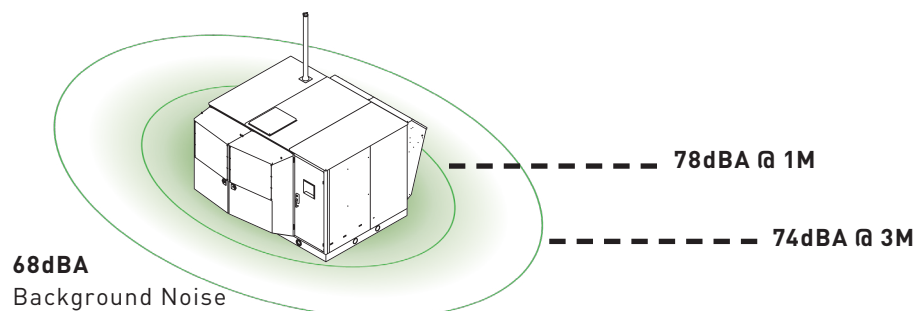
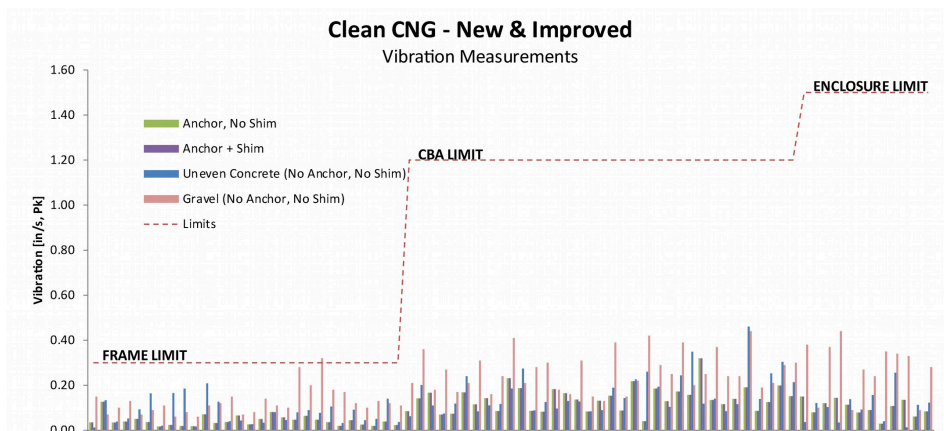
- Optional local data logging in .csv file format built into MCP HMI.
- All instrumentation and control valve states can be logged at user-definable sampling rate of up-to 1Hz to USB drive.
- Optional higher resolution alarm buffer allows capture of performance data just prior to alarm trigger to gain further insight into events leading up to alarm.



## ULTRA-LOW NOISE AND VIBRATION

### EXCEPTIONALLY LOW VIBRATION

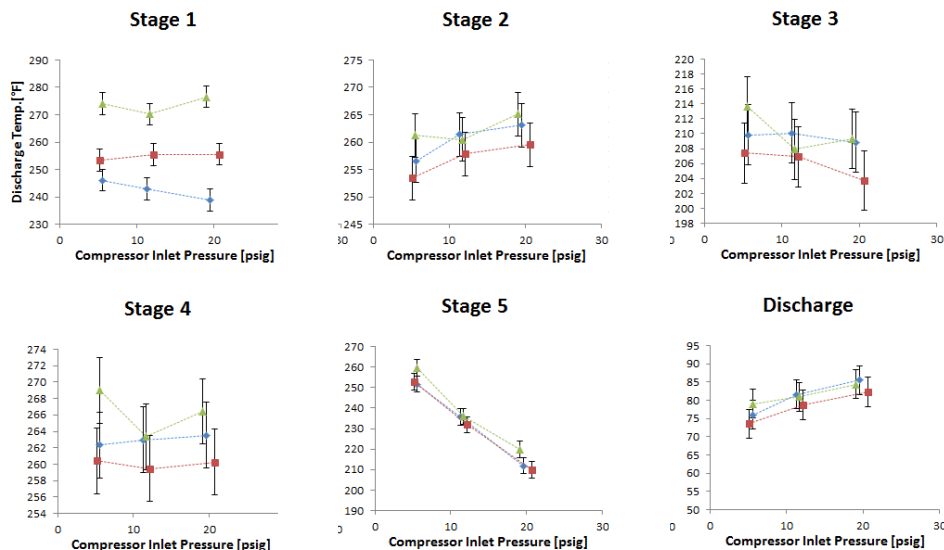
- Vibration is so low that a Canadian dollar coin can be balanced on edge on the compressor block while operating.
- Measured vibration limits throughout compressor package (CBA, frame, enclosure), all significantly below industry guidelines.



## INLET PRESSURE PERFORMANCE

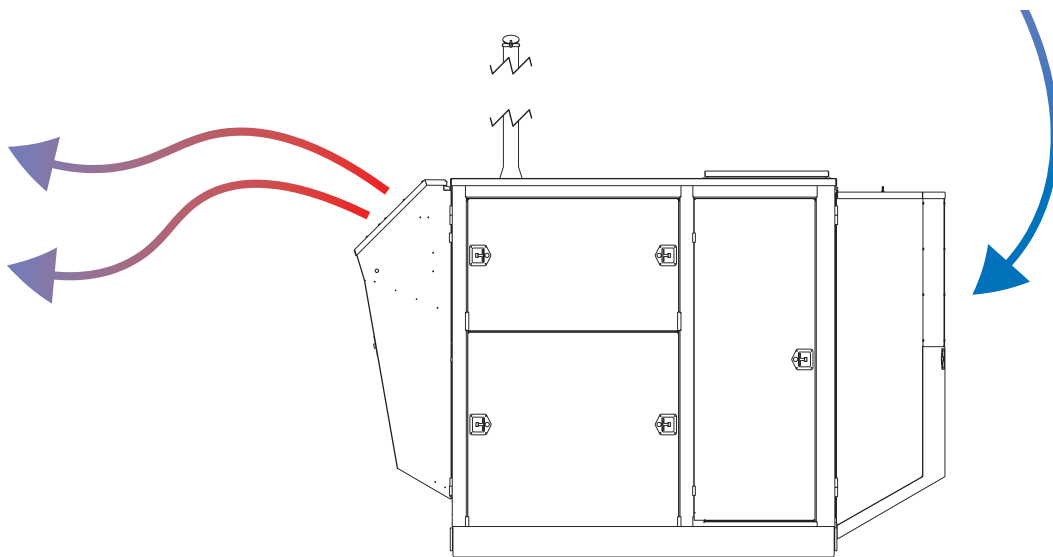
### EXCEPTIONAL PERFORMANCE

- Measured -11.5 C temperature approach on discharge gas; industry generic is -6.5 C.
- 3-7% less power draw as compared to similar models.
- 4-14% increase in flow as compared to similar models.
- All inter-stage temperatures below 149C (300F).
- Low noise levels measured at 1m, 3m during operation.



## NO AIR RECIRCULATION BETWEEN UNITS

- “Poke-yoke” inlet and discharge louver design ensures multiple adjacent compressor packages don’t recirculate air amongst themselves, and allows for simplified more compact site layout without penalty in cooling efficiency.



FULLY  
FEATURED

## CBA MONITORING PORTS

- Test ports on each stage allow for on-site evaluation of valve performance and piston ring condition without dismantling and site shut down.
- Optional built-in check valves.

## EASY ACCESS OF PREVENTATIVE MAINTENANCE ITEMS

- Clear access to inlet and discharge filters. Mechanical control panel for solenoids and check valves.
- Open avenue to sheaves and belts via service pathway.
- Integrated crane system for motor removal.
- Full access to CBA via rear service pathway and inlet louver swinging doors.
- CBA center-wing access hatch, coupled with roof mount tripod for removal and servicing of center-wing.
- Improved ease of access to relief valves for annual recertification via rear panel.

## LOCKABLE RECOVERY TANK RELIEF VALVE (PRV)

- Allows annual re-certification of PRV without the need to vent the recovery tank.

## FULL RECOVERY TANK ISOLATION

- Allows servicing of compressor without the need to vent the recovery tank.

## DRYER REGENERATION GAS CONNECTION

- Allows for regeneration of manual gas dryer, even when service gas inlet pressure is too low.

## OPTIONAL EXTERNAL CONTROL GAS CONNECTION

- Compressor package can be controlled via air pilot gas if desired.

## CLEAN ENERGY COMPRESSION PRODUCTS

### COMPRESSION

CleanCNG™

CleanCNG-C

UnpluggedCNG

CompleteCNG™

### PRESSURE REDUCTION

CleanPRS

CompletePRS

MobilePRS

### DISPENSING

TimefillCNG

TrailerfillCNG

TrailerdecantCNG

### HIGH EFFICIENCY VIRTUAL PIPELINE

OffgridCNG

## PROJECT MANAGEMENT

Clean Energy Compression has a dedicated Program Management office that oversees projects in all phases; including initiation, planning execution, monitoring, control, and completion. All projects include a project charter, stakeholder register, responsibility assigned matrices, and project schedule.

## MANUFACTURING

A global leader in manufacturing CNG fueling systems, Clean Energy Compression meets all ISO 9001:2008 Quality Management System Safety and Environmental protocols. Clean Energy Compression offers complete CNG fueling systems that are tested in house with Natural Gas and don't leave the factory until they are 100% certified field-ready.

## SERVICE

All Clean Energy Compression projects are supported by a global service network. Customer Care representatives closely monitor performance of units in the field in real-time 24/7. A global network of parts and service providers are available for first-class support on all products.



Clean Energy Compression

43676 Progress Way

Chilliwack, BC, Canada, V2R 0C3

Tel +1-604-795-9491

Fax +1-604-792-3806

[www.CleanEnergyFuels.com/compression](http://www.CleanEnergyFuels.com/compression)