



Arrow Overview

ARROW ENGINE COMPANY • TULSA, OK

OVERVIEW-ML-S-FEB15



**A Tradition of Excellence
Since 1955**



In 1955 Arrow Engine Company opened for business, beginning the tradition of providing premium service and exceptional products to the oil & gas industry, as well as the industrial engine market, throughout the world.

Arrow Engine Company is a part of IES Infrastructure, a division of IES Holdings, Inc. (NASDAQ: IESC) which offer electrical and mechanical apparatus services, custom steel fabrication, and specialized power solutions

With a consistent focus on our customers' needs, striving to help them grow their business, and producing the most reliable equipment and parts in the industry, Arrow has forged a tradition of excellence since 1955.



ENGINES pg 4-5

GENSETS pg 6-7

POWER UNITS pg 8-9

COMPRESSORS pg 10-11

PACKAGING pg 12-13

GAS PRODUCTS pg 14-15

ELECTRONICS pg 16-17

CHEM PUMPS pg 18-19

REPLACEMENT PARTS pg 20-21



ENGINES

C-46, C-66, C-96,
C-101 & C-106



C-255



K-6



L-795



A-42



A-54 Power Unit



A-62 Power Unit



A-90 Power Unit



A-90 Generator



ARROW ADVANTAGES

- Designed for continuous duty, 24/7
- Run on a variety of low BTU gases (Natural Gas, Methane, Butane, Propane, Diesel)
- Utilizes heavy flywheels to provide high inertia running at low RPM (C-Series)
- Less wear, less maintenance, and less repair compared to higher RPM engines (C-Series)
- Naturally Aspirated and Turbocharged Aftercooled (A-Series)
- Lowers operating costs as much as half the cost of electric motors
- Solid State ignition systems are standard.
- All Arrow engines are EPA certified or certifiable for emissions standards

ENGINE COMPARISON CHART

ENGINE	CYL	RATIO*	BHP	RPM
VR 220 (Parts Only)	4			
A-32	3	9.0:1	17-24.5	1,000-1,200**
A-42 (VR 260)	4	9.0:1	17-47	1,000-1,800
A-54 (VR 330)	6	8.0:1	26-68	900-1,800
A-54 Crossflow	6	8.0:1	35-72	1,000-1,800
A-62 (VR380)	6	9.0:1	40-80	900-1,800
A-62TA (VR380TA)	6	9.0:1	64-115	1,000-1,800
A-90	6	9.0:1	57-109	900-1,800
A-90TA	6	9.0:1	82-167	1,000-1,180
C-46	1	4.8:1	5-9	450-800
C-66	1	5.2:1	7-13	350-700
C-96	1	4.8:1	11-19	300-600
C-101	1	6.2:1	19-24.5	400-800
C-106	1	6.2:1	17-32	300-800
C-255	2	7.0:1	32-55	400-750
L-795	2	5.3:1	35-65	300-600
K-6	1	8:1	2.7-4.8	400-800

*Compression Ratio
**Steady state operation only

Aluminum Guard

The Arrow aluminum guard is now a standard feature of all C-Series engines.



AutoStart NS-2

Our new AutoStart NS-2 control panel is a simple, programmable system that is compatible with all Arrow Engines.



Clutch Actuator

Arrow has introduced its new patented Clutch Actuator for C-Series and A-Series Arrow Engines.



C-SERIES ENGINE FOR PUMP JACK



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GENSETS

ANY ARROW ENGINE
ENCLOSURE OPTIONS AVAILABLE
NATURAL GAS FUELED



A-42 GENSET



A-54 GENSET



A-62 GENSET



A-90 GENSET

APPLICATIONS

- Prime power for facilities
- Backup power
- Emergency power
- Electricity for remote locations
- Compressor power
- Irrigation power
- Hydraulics power

C-SERIES GENSET POWER RATINGS

MODEL	CYLINDERS	kW RATING	ENGINE RPM	ALTERNATOR RPM
C-46 AC	1	5	700	1,800
C-46 DC	1	5	700	1,800
C-66 AC	1	7.5	600	1,800
C-96 AC	1	15	600	1,800
C-106 AC	1	25	700	1,800

A-SERIES GENSET POWER RATINGS

MODEL	PRIME POWER RATINGS		STANDBY POWER RATINGS	
	1800 RPM kW RATING	1500 RPM kW RATING	1800 RPM kW RATING	1500 RPM kW RATING
A-42	28	23	30	25
A-54	43	36	48	39
A-62	50	42	55	45
A-62 TA	75	63	83	69
A-90	75	68	83	61
A-90 TA	100	95	109	105

GENSET ENCLOSURE



BACKUP GENERATOR FOR CNG STATION



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POWER UNITS



A-SERIES POWER RATINGS

INTERMITTENT

CONTINUOUS

MODEL	PEAK INTERMITTENT TORQUE @ RPM		BRAKE HORSEPOWER AT SPEEDS INDICATED (S.A.E.)											
	FT. LB.	N*M	900		1000		1200		1400		1600		1800	
A-32 Natural Gas	105@900		90	17	20	18	24	22						
A-42 Natural Gas (VR260)	165@1200	224@1200			30	28	38	34	44	40	48	44		47
A-54 Natural Gas (VR330)	220@1600	298@1600	29	26	36	33	47	42	58	52	67	60	75	68
A-54 HD-5 Propane (VR330)	285@1400	386@1400	43	39	50	45	64	58	76	69	85	76	92	83
A-54CF Natural Gas (VR330)	233@1600	317@1600			38	35	50	45	61	55	71	64	80	72
A-62 Natural Gas (VR380)	269@1400	365@1400	44	40	49	45	61	55	72	65	81	74	88	80
A-62 Turbo Natural Gas	392@1400		55	50	72	65	87	79	105	95	120	108	131	118
A-90 Natural Gas	376@1200	510@1600	61	53	72	63	85	75	97	88	110	100	121	109
A-90 Turbo Natural Gas	527@1600						116	100	140	127	160	145	167	151

A-SERIES FEATURES

- A tradition of excellence since 1955 operating on natural and well-head gas
- Capable of operating on most spark-ignited fuels
- Most popular ignition systems available
- Lifting eyes (front & rear)
- Forged steel crankshaft and connecting rods
- Crankshaft dynamically balanced with hardened journals
- Heavy-duty, deep-skirted crankcases
- Exhaust manifold with top or rear outlets
- Replaceable precision main and rod bearings
- Full pressure lube oil system with full flow oil filter
- Flywheel - SAE No 3 with ring gear and SAE No 3 housing
- Overhead valve cylinder heads with replaceable guides and seats
- Five main bearings on A-42 and seven main bearings on A-54 and A-62
- 10% regulated speed by mechanical governor (other options available)
- 4-groove crankshaft pulley, 2-groove fan, 1-groove water pump, 4th-groove auxiliary
- Single- or double-plate clutch available
- Wet Liners



A-90



A-42



A-54



A-62



A-62



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COMPRESSORS



VRC-2

- Two-throw separable reciprocating gas compressor
- Horizontally opposed cylinders accurately balanced for smooth running
- Long lasting durability at 1800 RPM
- Unique three-throw crankshaft configuration eliminates opposing cylinder offset and the vibration associated with traditional designs
- Combined rod-load capability of 14,000 lbs
- Pressurized lubrication system, Hoerbiger valves, and industry proven accessories standard on all Arrow compressors



VRC-2



VRS-2

VRS-2

- 275 hp at 1800 rpm
- 3" Stroke
- Combined rod-load capability of 20,000 lbs
- Separable distance pieces
- Babbitted crossheads
- Double-acting and steeple cylinders from 2.25" to 10" diameter
- Variable volume clearance pockets
- Premier pressurized cylinder lubrication
- Hoerbiger's latest valve design
- Carbon-filled Teflon® rings and packing



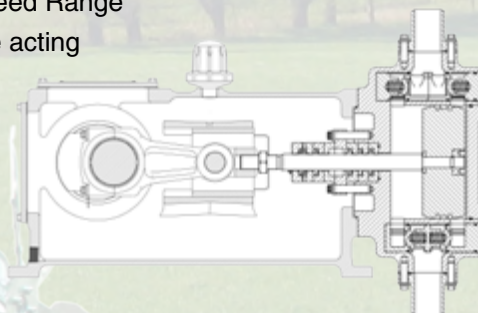
VRC-CNG

VRC-CNG

- Two-throw compressed natural gas compressor
- Rated at 150 Horsepower
- 3" stroke
- Motor or engine driven
- Combined rod-load capacity of 16,000 lbs
- Maximum Speed 1800 RPM
- Forged steel connecting rods
- First stage 8.5" cylinder rated 250 PSIG MAWP
- Second stage 4.25" cylinder rated 750 PSIG MAWP
- Third stage 2.25" cylinder rated 2500 PSIG MAWP
- Final stage 1.125" cylinder rated 6,000 PSIG MAWP

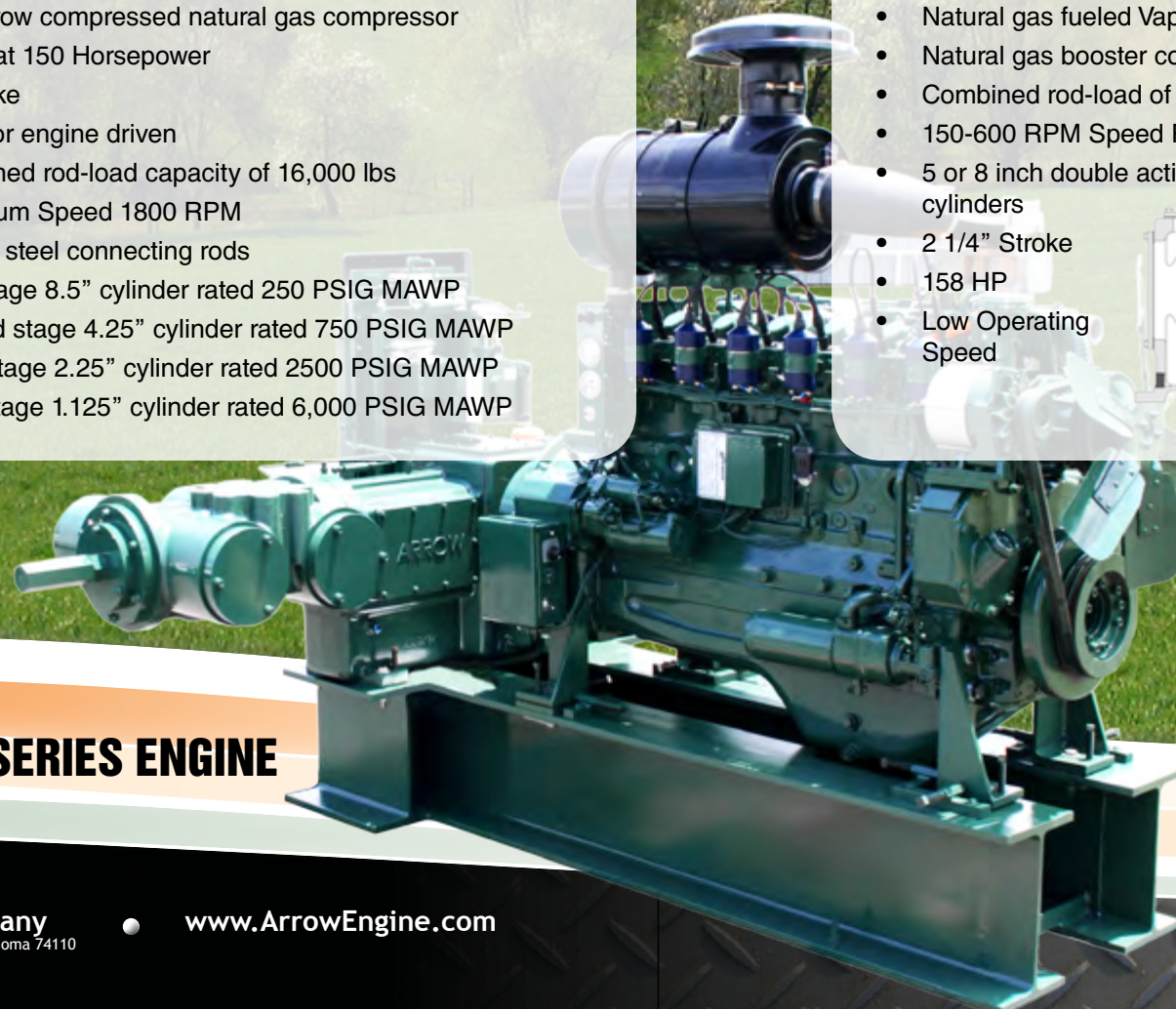
VRU-1 and VRU-2

- Natural gas fueled Vapor Recovery Unit
- Natural gas booster compressor
- Combined rod-load of 10,000 lbs
- 150-600 RPM Speed Range
- 5 or 8 inch double acting cylinders
- 2 1/4" Stroke
- 158 HP
- Low Operating Speed



VRU-1

VRC POWERED BY A-SERIES ENGINE



THREE-THROW CRANKSHAFT



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PACKAGING

AVAILABLE FOR
DOMESTIC OR
INTERNATIONAL USE



CNG STATION



GAS LIFT PACKAGE



FIELD GAS PACKAGE



VRU PACKAGE

PACKAGE OPTIONS

- Engine Drive or Electric Motor Drive
- Low BTU Carburetion
- Standard or Critical Grade Silencers and Catalytic Converters
- Class I, Div. 2, Group D Capable
- Automatic Bypass System/Suction Makeup
- Air/Gas/Electrical Starter System
- 12V/24V Electrical System
- Automatic Cooler Louvers
- Suction & Discharge Companion Flanges
- Trailer Mounting Available
- ASME Coalescing Fuel Scrubbers
- ASME Coded Scrubbers
- Piping design to meet B-33.3 standards
- Pressure Relief Valves
- Gas Cooler with Manual Louvers
- Spare Parts
- Packages available with A-42, A-54, A-54CF, or A-62 Arrow Engines, or 3306NA, 3406NA
- Other manufacturers' engines up to +/- 275 HP
- Easy to Operate
- Ergonomically Easy to Maintain
- Standard or Custom Paint
- Bent utility pipes
- 2-hole strap clamp bracing
- Ship-board cable in fiberglass tray
- Metal flex hose on oil make-up
- Concrete-filled skids

**VRC-2 Packages Powered by A-62 Engines
with Arrow Gas Products Vessels**



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GAS PRODUCTS



ASME CODE VESSEL



TANKS



COALESCER



METER RUNS



SEPARATOR

PRODUCTS

- Meter Runs (housing optional)
- Volume Tanks
- ASME Code Vessels
- Vertical & Horizontal Separators
- Suction Scrubbers
- Coalescers
- Skids

WELDING CAPABILITIES

- All types of pressure containing vessels
- Carbon steel
- Stainless steel
- Exotic alloys
- From 1/2" up to 108" diameter

ARROW ADVANTAGES

Arrow Gas Products strives to maintain the highest customer satisfaction by providing quality standards above and beyond the industry norm.

- On-site CWI monitors weld quality continuously
- State-of-the-art blast and paint facility
- Superior American made parts
- Meter Runs meet and exceed AGA standards

- Fabrication of meter tubes meets or exceeds API standards
- All vessels are built to ASME code standards
- Arrow ASME code stamp registered with NBIC ensures vessels have been inspected and conform to standards
- Authorized U and R stamps for ASME Section VIII as well as repairs and alterations
- 30,000 square foot of fabrication facilities

METER RUNS WITH HOUSING



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ELECTRONICS



ARROW ELECTRONICS

Cost effective and proven controls for engines and engine-driven equipment.

AUTOSTART NS-2

A simple, programmable system that is compatible with all Arrow Engines. Programs can be set for different cycles each day of the week as well as continuous monitoring of critical engine operating parameters and automatic shutdown. Easily automate and monitor your oil field operations.

ELECTRONIC CONTROL PANELS

Arrow's electronic control panels can be combined with Arrow Compressor Packaging to monitor functions, pressures, temperatures, vibrations, and liquid level controls. Arrow panels include a Compressed Natural Gas (CNG) panel for complex fueling stations, as well as a Field Gas Enunciator panel which is built to exceed our customer's requirements.



AutoStart NS-2



Electronic Control Panel



**A-62 Engine with CD-1
Ignition System**



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CHEM PUMPS

ELECTRIC, GAS,
BEAM, SOLAR,
& AIR
POWERED



SERIES 10



SERIES 12

CHEMICAL PUMPS

MODEL	OPERATION	PRESSURE (PSI)*	QUARTS**
SERIES 10	Beam	1,500-3,000	12-184
SERIES 12	Pneumatic	1,500-5,500	50-240
SERIES 430	Electric	600-3,000	1-640
SERIES 500	Pneumatic	2,000-12,000	64-2,400
SERIES 510	Pneumatic	100-6,000	9-128
SERIES 1200	Solar	1,200	20-40

* Maximum Discharge Pressure (PSI)

**Maximum Discharge Per Day (Quarts)

Series 1200 Solar Chemical Pumps

ARROW CHEMICAL INJECTOR PUMPS

Beam, gas, electric, solar, or air powered positive displacement Arrow Chemical Injector Pumps are precision engineered and designed for the injection of de-emulsifiers, solvents, corrosion inhibitors, lubricants, or methanol into gas systems, as well as desalting agents into wellheads and pipelines.

SERIES 510 MICROVALVE

Arrow's Series 510 pump is equipped with a Microvalve pump that operates slowly, one stroke every two minutes to twenty strokes per minute. Eliminates pilot valve problems.

SERIES 430

SERIES 500

SERIES 510



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ARROW MANUFACTURED REPLACEMENT PARTS



FAIRBANKS MORSE®



AJAX®



CATERPILLAR®



WAUKESHA®

REPAIR KITS

Arrow repair kits make engine repairs quick and easy by assuring all parts are present right from the start. Arrow carries more than 500 repair kits for everything from governor rebuilds to engine overhauls. All our parts meet or exceed OEM standards.

ARROW® OEM PARTS



ARROW OEM PARTS

Arrow Engine stocks a vast array of replacement parts for a wide variety of engines. Arrow knows that your products performance depends on quality parts. As the OEM for C-Series, K-Series, L-Series, and A-Series gas engine product lines, as well as chemical pumps, compressors, and associated products, we carry the very best parts and the most complete selection available anywhere. We have what you need to keep your Arrow product running at peak performance.

OTHER REPLACEMENT PARTS

Ajax®	Parts for over a dozen engine models
Caterpillar® 3300 Series	Complete engine rebuild kits, water pump kits, gasket sets, and much more
Fairbanks Morse®	A vast array of engine replacement parts in stock
Waukesha®	Waukesha® Intermediate (140G/F554, 145G/F817, WAK/F1197) Waukesha® VHP® (F2895, F3521, L5108, L5790, L7042, P9390) Waukesha® VGF® (F18/H24)



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A Tradition of Excellence

Quality Products Engineered to Last



1955



1975



2012

Since 1955



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C-SERIES	C-46	C-66	C-96	C-101	C-106	C-255
A-SERIES	A-32	A-42	A-54	A-62 A-62 Turbo A-62 Genset	A-90 A-90 Turbo A-90 Genset	A-160 A-160 Turbo A-160 Genset
K-SERIES	K6					
L-SERIES	L-795					



GAS PRODUCTS	Meter Runs Meter Skids	Volume Tanks Coalescers Structural Skids	2 & 3-Phase Separators Fuel Gas Cond. Skid	Heater Treater Indirect Heater H2S Scavenger Unit	Dehydration Unit Liquid Stabilizer
CHEMICAL PUMPS	10 Series (beam operated)	430 Series (electric)	12, 500, & 510 Series (pneumatic)	Solar Chemical Pumps	OEM & Aftermarket Spare Parts



COMPRESSION PRODUCTS	Compressor Frames VRC-2 VRS-2 VRS-4 (Coming Soon)	CNG Compressor Frames & Packages VRC-CNG	Vapor Recovery Units VRU-1 VRU-2	Gas Lift Packages Electric HP Gas Engine (VR, A-Series, Cat)	Custom Compression Packages
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CATERPILLAR®	G379	G398	G399	G3304	G3306
WAUKESHA®	F2895 F3521 F5108	L5790 L7042	P9390	145G/F817 140G/F554	F18 H24 WAK/1197
FAIRBANKS®	ZC-118	ZC-208	ZC-503	ZC-739	ZC-346
AJAX®	5 × 6½	EA-22, 6½ × 8 CMA EA30, 7½ × 10 CMA EA-30, 7¼ × 8 CMA E-42, 8½ × 10 CMA		DP-60, 9½ × 10 CMA DP-115/230, 13½ × 16 DP-70/80/160, 11 × 14 CMA	

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