MARKET AND APPLICATION GUIDE

OIL-FREE GAS COMPRESSORS

AGRICULTURAL INDUSTRY

USERS: Fertilizer Manufacturers, Storage Facilities, Pipeline, Barge, Ocean, Tanker and Truck Terminals, Market Distribution Plants, Transportation Companies - tank Trucks (both Operators and Fabricators).

APPLICATION	GAS	OPERATION	TYPICAL COMPRESSOR MODELS
Liquid Transfer and Vapor Recovery	NH_3 (Anhydrous Ammonia)	1. Tank Truck Unloading & Filling. 2. Railroad Tank Car Unloading & Filling. 3. Field Tank (Nurse Tank) Filling for use on farms. 4. Marine Barges - Unloading and Filling. 5. Storage Tank 'Padding' for Feeding Process Pumps to Prevent Cavitation	Single-Stage Single-Seal Air-Cooled
Vapor Recovery Only	NH_3 (Anhydrous Ammonia)	1. "Boil Off Vapors" from Low Pressure Refrigerated Storage Facilities - Marine, Pipeline, Manufacturing Plants and Terminals. 2. Vapors and Residual Liquid. 3. Railroad Tank Cars 4. Cylinders	Single-Stage Single-Seal Air-Cooled

AEROSOL INDUSTRY

USERS: Manufacturers of Pressurized Propelled (Aerosol) Products, such as Cosmetics, Household Products, Pesticides and insecticides Packagers, and Custom or Private Packagers.

APPLICATION	GAS	OPERATION	TYPICAL COMPRESSOR MODELS
Liquid Transfer by Pressure Differential with Residual Liquid and Vapor Recovery	LPG (Liquefied Petroleum Gas) Propane, Butane, and Various Mixtures Sulfur Dioxide DME (Dimethyl Ether) CFC's (Chloro-fluorocarbons) HCFC's (Hydrochloro-fluorocarbons)	1. Railroad Tank Car and Tank Truck Unloading into Manufacturers Storage. 2. Large Cylinder Evacuation of Liquid and Vapor in Smaller Operations.	Single-Stage Double Seal
Pressure Boosting		1. Vapor Pressure Boosting or "Padding" to feed Liquid Pump without Cavitation.	
Recovery of Trapped Liquid and Vapors		1. Removing Trapped Liquid or Vapors from Filling Lines or other Piping.	

BEVERAGE INDUSTRY

USERS: Breweries, Carbonated Drink Bottlers, Wineries

APPLICATION	GAS	OPERATION	TYPICAL COMPRESSOR MODELS
Liquid Transfer by Pressure Differential with Residual Liquid and Vapor Recovery.	Carbon Dioxide	1. Railroad Tank Car or Tank Truck Unloading at Customer's Storage.	Single-Stage Double Seal
Vapor Recovery Only		1. Carbon Dioxide Vapors from Process. 2. Vapor Recovery from Storage Tank Relief- "Boil-Off."	Single-Stage Double Seal
Pressure Boosting	Nitrogen or Air	1. Instrumentation	Single or Two-Stage Double Seal

CHEMICAL AND PETRO-CHEMICAL INDUSTRY

USERS: Large Chemical and Petro-Chemical Manufacturing Plants, Including Pharmaceuticals, Plastics, (Polymers) and Various Industrial Chemicals.

<table>
<tr><th>APPLICATION</th><th>GAS</th><th>OPERATION</th><th>TYPICAL COMPRESSOR MODELS</th></tr>
<tr><td>Liquid Transfer by Pressure Differential with Residual Liquid and Vapor Recovery</td><td>Propane
Normal Butane
Iso-Butane
Propylene
Mercaptan
Ethane
Others</td><td>1. Railroad Tank Car and Tank Truck Unloading and Recovery of Vapors.</td><td>Single-Stage
Double or Triple Seals</td></tr>
<tr><td rowspan="3">Pressure Boosting</td><td>Nitrogen</td><td>1. Plant Instrumentation.
2. Laboratory Instrumentation.
3. Miscellaneous Applications.</td><td rowspan="2">Single or Two-Stage
Double Seal</td></tr>
<tr><td>“Oil-Free” Air</td><td>1. Sand Blasting
2. Instrumentation.
3. “Start-Up” Air
4. Miscellaneous Applications.</td></tr>
<tr><td>“Tail” Flare Gas Disposal</td><td>1. Recovery of Gases Relieved in Process for Environmental Reasons.</td><td rowspan="2">Single-Stage
Double or Triple Seal</td></tr>
<tr><td rowspan="2">Liquid Transfer by Pressure Differential with Residual Liquid and Vapor Recovery</td><td>Methylamines</td><td rowspan="2">1. Railroad Tank Car and Tank truck Unloading and Recovery of Vapors.
2. Manufacturing Process as Booster.
3. Evacuation of Storage Tanks and Piping.</td></tr>
<tr><td>Hydrogen Chloride, Anhydrous
Butadiene</td><td>Single-Stage
Triple Seal</td></tr>
</table>

ELECTRICAL EQUIPMENT-CHEMICAL INDUSTRY

USERS: Manufacturers of Large Industrial and Utility Electrical Power Apparatus for Sub-stations, Generating Plants and Transmission Systems.

APPLICATION	GAS	OPERATION	TYPICAL COMPRESSOR MODELS
Pressure Boosting	Sulfur-Hexafluoride SF_6	1. Maintain Gas Pressure in System and Recycle Vapors as Pressure Lowers-Gas Pressure is Maintained to Prevent Arcing of Electrical Current.	Single-Stage Double Seal
Vapor Recovery and Recirculation	Argon Helium	1. Manufacturers of Electrical Equipment. 2. Arc Welding Processes as Shield.	Single or Two-Stage Water-Cooled Double Seal

FOOD PROCESSING INDUSTRY

USERS: Frozen Food Processors-Meats, Vegetables, Fruits, Dairy Products and Other Processed foods.

APPLICATION	GAS	OPERATION	TYPICAL COMPRESSOR MODELS
Liquid Transfer by Pressure Differential with Residual Liquid and Vapor Recovery	Carbon Dioxide Anhydrous Ammonia Fluorocarbon Refrigerants (Freon)	1. Railroad Tank Car Unloading at Processor Plant 2. Tank Truck Unloading 3. Marine Barge Unloading	Single-Stage Double Seal
Pressure Boosting	Anhydrous Ammonia	1. Recirculation of Vapors in Refrigeration System.	Single or Two-Stage Double Seal
	Nitrogen	1. Instrumentation	
	"Oil-Free" Air	1. Instrumentation 2. Aeration of Frozen Dairy Products and Milk.	
Vapor Recovery Only	Carbon Dioxide Nitrogen	1. Frozen Food "Quick Freeze" Processing 2. Vapor "boil-Off" Relieved from Storage Tank to Maintain Desired Pressure Level	Single-Stage Double Seal

LIQUEFIED PETROLEUM GAS INDUSTRY

USERS: Producers, Tank Truck Companies-Aboveground and Underground Storage, Refrigerated Storage, Marine Terminals, Truck Terminals, Cylinder Filling Plants.

APPLICATION	GAS	OPERATION	TYPICAL COMPRESSOR MODELS.
Liquid Transfer with or without Residual Liquid and Vapor Recovery.	Propane Normal Butane Iso-Butane Mixtures	1. Liquid transfer to and from railroad tank cars, tank trucks, portable tanks and storage tanks. 2. Marine vessel loading and off loading. 3. Storage tank padding to prevent pump cavitation.	Single-Stage Single Seal
Vapor Recovery Only		1. Remove residual liquid and /or vapors from storage or transportation tanks prior to service, refilling or changing product. 2. Recover residual liquid and/or vapors from plant piping systems, hoses, and loading arms. 3. Vapor evacuation from cylinders prior to refilling. 4. Recovery of “boil-off” vapors from large, low pressure, refrigerated storage.	Single-Stage Double Seal

PETROLEUM INDUSTRY
OIL & GAS PRODUCTION AND PROCESSING

USERS: Petroleum Producing Companies, Refining Companies and/or Gasoline Blending Plants, Natural Gas Producing and Pipeline Companies, Natural Gas Processing Plants, Tank Truck Companies.

APPLICATION	GAS	OPERATION	TYPICAL COMPRESSOR MODELS
Pressure Boosting	Natural Gas	1. Boosting pressure of wellhead gas to allow it to enter a pipeline. 2. Boosting wellhead gas to be used as fuel for on-site treatment equipment. 3. Reducing pressure on wellhead in order to increase production.	Single or Two-Stage Double Seal
Vapor Recovery	Petroleum Vapors / Natural Gas	1. Recovery and circulation of vapors produced by oil in storage tanks.	
Liquid Transfer with Recovery of Residual Liquids and Vapors	Normal Butane	Railroad Tank Car Unloading at: 1. Refineries with inadequate butane production to blend with gasoline for non-heating fuel. 2. Marine terminal: imported refined raw gasoline for blending for non-heating fuel.	Single-Stage Single or Double Seal

PUBLIC UTILITIES

USERS: Natural Gas Distribution Companies, Electrical Power Generating Plants

APPLICATION	GAS	OPERATION	TYPICAL COMPRESSOR MODELS
Pressure Boosting	Nitrogen or Air	1. Instrumentation.	Single or Two-stage Double Seal
	Natural Gas Fuel	1. Increase gas fuel pressure from utility pipeline to customer's furnaces or burners. 2. Evacuation of gas from systems prior to maintenance - environmental	
Liquid Transfer and Vapor Recovery	Anhydrous Ammonia	1. Railroad tank car or tank truck unloading-product used to clean smoke stacks for environmental purposes.	
Fuel	Propane	1. Mixing propane with air to supplement natural gas utility systems. Used during natural gas shortages. 2. Large storage facilities at various urban communities or manufacturing plants where propane is used as an alternative fuel to natural gas during emergencies and/or peak demand - commonly referred to as "stand –by plants".	Single-Stage Single or Double Seal
Pressure Boosting – Recirculation of Vapors	Sulfur Hexafluoride (SF_6)	1. Circulation of gas through large electrical switching gears at large power plants or sub-stations.	Single-Stage Double Seal

REFRIGERANT AND AIR-CONDITIONING INDUSTRY

USERS: Manufacturers of Fluorocarbon (Freon) Type Refrigerants, Large Distributors of Refrigerants and Air-Conditioning Equipment Manufacturers.

<table>
<tr><th>APPLICATION</th><th>GAS</th><th>OPERATION</th><th>TYPICAL COMPRESSOR MODELS</th></tr>
<tr><td>Liquid Transfer by Pressure Differential with Residual Liquid and Vapor Recovery</td><td rowspan="3">Refrigerant (Freon)

11, 13, 14, 21,

22, 112, 113,

131, 134a, 134b,

142a, etc</td><td>1. Railroad Tank Car and Tank Truck Unloading and recovery of vapors at refrigerant manufacturers and their customer’s facilities.</td><td>Single-Stage

Double Seal</td></tr>
<tr><td>Evacuation Refrigerant Vapors</td><td>1. Cylinder Evacuation at Cylinder Refilling Facilities.

2. Refrigerant Systems or Cooling System Gas Evacuation.
Example: Atomic Plant Cooling System.</td><td rowspan="2">Single or Two-Stage

Double Seal</td></tr>
<tr><td>Vapor Recovery</td><td>1. Air Conditioner Manufacturers and Condenser Coil Manufacturers Testing Process. Vapors Recovered and Re-used.

2. Vapors from used containers that are not to be destroyed - environmental.

3. Vapor Recovery at Cylinder Filing Operation.</td></tr>
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MISCELLANEOUS INDUSTRIES AND USERS

APPLICATION	GAS	OPERATION	TYPICAL COMPRESSOR MODELS
GENERAL INDUSTRIAL MANUFACTURERS			
Vapor Recovery	Argon	1. Industrial Applications using this Gas as an Atmosphere. Vapors are recovered for economical and environmental reasons.	Single or Two-Stage Water-Cooled Double Seal
SOAP AND DETERGENT MANUFACTURERS			
Liquid Transfer with Residual Liquid and Vapor Recovery	Dimethylamine	1. Railroad Tank Car Unloading for use in Soap and Detergent Plants	Single-Stage Double Seal
SYNTHETIC RUBBER MANUFACTURERS			
Liquid Transfer with Residual Liquid and Vapor Recovery	Methyl Chloride Hydrogen Chloride (Anhydrous)	1. Railroad Tank Car and Tank Truck Unloading and Vapor Recovery. 2. Cargo Cylinder Evacuation.	Single-Stage Double or Triple Seal
CARBON DIOXIDE MANUFACTURERS			
Liquid Transfer with Residual Liquid and Vapor Recovery	Carbon Dioxide	1. Railroad Tank Car Unloading and Vapor Recovery. 2. Boil-Off Vapor Recovery from Low Pressure, Refrigerated Storage.	Single-Stage Single or Double Seal

MISCELLANEOUS INDUSTRIES AND USERS

APPLICATION	GAS	OPERATION	TYPICAL COMPRESSOR MODELS
EPOXY / URETHANE AND PAINT MANUFACTURING			
Vapor Recovery	Fluorocarbons "Freons"	1. Vapor Recovery from Manufacturing Process	Single-Stage Double Seal
FIRE EQUIPMENT MANUFACTURERS			
Residual Liquid and Vapor Recovery	Halocarbons	1. Evacuation of Liquid/Vapor Processing Systems	Single-Stage Double Seal
HAZARDOUS WASTE AND EMERGENCY SERVICE COMPANIES			
Liquid Transfer and /or Vapor Evacuation	All Compatible Gases	1. Recovery of Liquid and/or Vapor from Overturned or Damaged Transportation Vehicles. 2. Evacuation of Hazardous Gas or Liquids from Damaged or Obsolete Vessels.	Single-Stage Double or Triple Seal
MEDICAL			
Pressure Boosting	Air	1. Central Hospital Air Supply Systems for use in patients rooms with medication, etc.	Single or Two-Stage Double Seal
Vapor Recovery	Nitrous Oxide	1. Vapor Recovery from Boil-Off, from Low Pressure, Refrigerated Storage.	
	Ethylene Oxide	1. Vapor Recovery from Sterilization of Hospital Equipment	