MONARCH RESOURCE PARTNERS

SUSTAINABILITY REPORT | 2023

PASSION PRECISION SERVICE INNOVATION

Where Passion and Service Drive Innovation

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COMPANY PROFILE

Monarch Resource Partners ("Monarch") is an energy infrastructure company focused on large horsepower natural gas compression. With our proprietary E-Skid™ and EcoFlex™ technology, we have pioneered the transition to electric compression infrastructure, providing our customers with increased volume flexibility, superior reliability, and reduced cost while significantly reducing emissions versus traditional gas-fired compression equipment. We are the first and only zero-emission, fully electric-drive fleet in the compression industry.

Compression equipment is mission-critical infrastructure that is essential to producing, processing, and transporting the natural gas that heats and powers American homes. We are laser-focused on maximizing the uptime and reliability of our compression equipment. We guarantee our customers a minimum mechanical availability on our equipment of 98%. Our EcoFlex™ fleet requires significantly less maintenance than traditional gas-fired compression equipment, giving our customers the highest availability in the industry.

At Monarch, our goal is to provide both our employees and customers with a consistent and sustainable service in a work environment that focuses on family, safety, professional growth, and pride in the products and services we deliver. Our core principles of innovation, passion, reliability, precision, and sustainability drive our company culture. This strong company culture has enabled us to attract the most experienced, highly skilled workforce in the compression industry. As a result, we are able to provide unparalleled service to our customers in a safe and reliable manner. Combined with our highly trained and experienced workforce, our unwavering commitment to ensuring the safety of our employees and customers has allowed us to maintain an excellent safety record.

INTRODUCTION

The primary aim of this sustainability report is to both qualify and quantify the environmental advantages of electric compression compared to reciprocating internal combustion engine (RICE) compression based on the following criteria:

1. Environmental (direct and indirect emissions).
2. Prevention/conservation of waste streams.
3. Permitting overhead and compliance burden.
4. Client Health, Safety, and Environmental ("HSE") goals.

Additionally, it is important to note that Monarch's focus on sustainability reaches well beyond our zero-emissions compression solution. With a company culture that prioritizes professional growth, family, community engagement, and safety, we strive to offer a higher quality of service while maintaining a healthy environment for all stakeholders.

ENVIRONMENTAL

The purpose of the United States Environmental Protection Agency's ("EPA") Scope Emissions Evaluation is to assess and quantify the total emissions of greenhouse gases ("GHGs") and other pollutants associated with a specific activity, process, facility, or sector. This evaluation helps identify sources of emissions, estimate their magnitude, and evaluate their environmental impact. It provides valuable information for regulatory compliance, policy development, emissions reduction strategies, and environmental management efforts aimed at improving air quality and mitigating potential climate issues.

CONTEXT AND DEFINITION OF TERMS

SCOPE 1 EMISSIONS

Scope 1 Emissions are direct GHG emissions that occur from sources that are controlled or owned by an organization (e.g., emissions associated with fuel combustion in boilers, furnaces, stationary engines, vehicles, etc.). This emissions category refers to direct GHG emissions originating from sources owned by an organization. These emissions include:

1. **Combustion of Fossil Fuels:** This includes emissions from the burning of fuels such as gasoline, diesel, natural gas, coal, and other fuels in facilities, vehicles, and equipment owned and/or operated by the organization.
2. **Process Emissions:** Some industries produce GHGs as part of their manufacturing or production processes. These emissions are considered Scope 1 if they originate directly from the organization's operations.

Scope 1 Emissions are considered direct because they originate from sources that are directly within the organization's sphere of control. They are typically the easiest to measure and manage within an organization. Reducing Scope 1 Emissions often involves improving energy efficiency, transitioning to cleaner-burning fuels or renewable energy sources, and implementing process improvements to minimize emissions from industrial activities.

SCOPE 2 EMISSIONS

Scope 2 Emissions are indirect GHG emissions associated with the purchase of electricity, steam, heat, or cooling. Although Scope 2 Emissions physically occur at the facility where they are generated, they are accounted for in an organization's GHG inventory as they are a result of the organization's energy use. Figure 1 provides a graphical overview of GHG Protocol scopes and emissions across the entire industrial/commercial value chain.

Scope 2 Emissions are categorized as indirect emissions because although the organization does not directly produce the emissions, it is responsible for them through consumption of purchased energy.

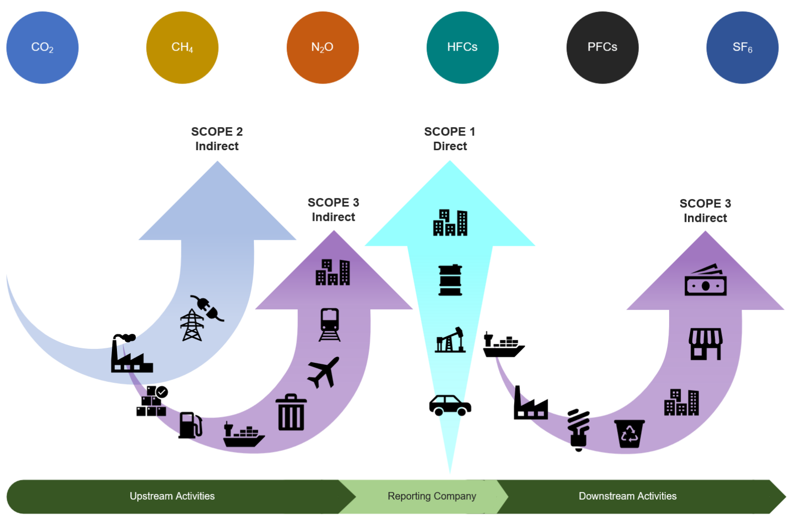
Organizations often include Scope 2 Emissions in their GHG inventories to provide a more comprehensive understanding of their environmental impact and as a mechanism for tracking progress regarding the reduction of emissions through energy consumption. Additionally, Scope 2 Emissions are an important consideration for organizations seeking to transition to renewable energy sources to reduce their carbon footprint.

SCOPE 3 EMISSIONS

Scope 3 Emissions refers to indirect GHG emissions that occur in an organization's value chain, including upstream and downstream activities not directly owned or controlled by the organization. These emissions typically result from sources such as business travel, employee commuting, purchased goods and services, transportation and distribution, waste disposal, and other activities associated with the organization's operations – carried out by external entities.

Scope 3 Emissions are considered the broadest and most challenging category of GHG emissions to measure and manage because they encompass a wide range of activities and involve multiple stakeholders beyond the direct control of the reporting organization. However, addressing Scope 3 Emissions is crucial for understanding and mitigating an organization's total carbon footprint and environmental impact throughout its entire value chain.

Figure 1: GHG Protocol Scopes and Emissions Across the Value Chain



Legend

- Purchased Goods and Services
- Capital Goods
- Fuel and Energy Related Activities
- Transportation and Delivery
- Waste Generated from Operations
- Business Travel
- Employee Commuting
- Leased Assets and Company Facilities
- Energy Production and Extraction
- Energy Storage
- Company Vehicles
- Processing of Sold Products
- Use of Sold Products
- Franchises
- End-of Life Treatment of Sold Products
- Investments

CLIMATE IMPACT

For most upstream and midstream locations, engine-driven compressors represent the most significant source of GHG, Criteria Pollutant, and volatile organic compound ("VOC") emissions. While GHG emissions present a climate risk, criteria pollutants and VOCs can negatively impact the health and wellbeing of residents near the emissions source.

GREENHOUSE GAS EMISSIONS

GHG emissions are gases in the Earth's atmosphere that can trap heat. These gases contribute to what is known as the "Greenhouse Effect," which is the warming of the Earth's surface and lower atmosphere. While this warming effect is essential for sustaining life on Earth (maintaining temperatures within a range conducive to life), both bio and anthropogenic activities risk increasing concentrations of certain GHGs in the atmosphere.

The primary GHGs include:

1. **Carbon Dioxide ("CO_2"):** This gas is the most prevalent GHG emitted through anthropogenic processes. It is released through activities such as burning fossil fuels (e.g., coal, oil, and natural gas) and certain heavy industrial processes. The recycling of this gas (in the atmosphere) is also stifled through deforestation.

   As of January 2022, the concentration of CO_2 in the Earth's atmosphere had exceeded 415 parts per million ("ppm"), according to measurements obtained at the Mauna Loa Observatory in Hawaii[1].

   GHG emissions are assessed based on Global Warming Potential ("GWP") and expressed in terms of Carbon Dioxide Equivalency ("CO_2e"). Therefore, the GWP of CO_2 is equal to 1. The standard timeframe used for calculating GWP (of GHGs) is usually 100 years, although shorter timeframes such as 20 years or 50 years may be used for assessing more immediate impacts.

2. **Methane ("CH_4"):** This gas is a potent GHG, though it occurs in lower concentrations compared to CO_2. It is released during the production and transportation of coal, oil, and natural gas, as well as from agricultural practices such as livestock digestion and manure management, and from the decay of organic waste in landfills.

   As of January 2022, the atmospheric concentration of CH_4 was approximately 1,875 parts per billion (ppb), according to measurements obtained at the Mauna Loa Observatory in Hawaii.

   The GWP of CH_4 over a 100-year timeframe is approximately 28-36 times greater than that of CO_2. This means that over a 100-year period, methane is estimated to have 28-36 times the warming potential of CO_2 per unit mass.

   However, it is important to note that methane has a shorter atmospheric lifespan than CO_2. While CO_2 can persist in the atmosphere for centuries to millennia, CH_4 typically has a lifespan of around 12 years before it is broken down through chemical reactions.

[1] (Trends in Atmospheric Carbon Dioxide, 2024)

3. **Nitrous Oxides (“N_2O”):** This gas is emitted through agricultural and industrial activities, as well as during combustion of fossil fuels and biomass. Agricultural practices such as the use of synthetic fertilizers and burning of biomass are significant sources of N_2O emissions.

   As of January 2022, the atmospheric concentration of N_2O was approximately 331 ppb, according to measurements obtained from the Mauna Loa Observatory in Hawaii.

   The GWP of N_2O over a 100-year timeframe is approximately 265 – 298 times greater than CO_2.

4. **Fluorinated Gases:** These gases including hydrofluorocarbons (“HFCs”), perfluorocarbons (“PFCs”), sulfur hexafluoride (“SF_6”), and nitrogen trifluoride (“NF_3”), are synthetic GHGs used in various industrial applications such as refrigeration, air conditioning, insulation, and electronics manufacturing. These gases are liberated during production, use, and disposal of products which contain them.

   While these gases possess a GWP of between 1,000 and 23,000 times that of CO_2, they are found in trace amounts relative to CO_2, CH_4, and N_2O.

CRITERIA POLLUTANTS

Criteria Pollutants are a group of air pollutants that are regulated by national ambient air quality standards (“NAAQS”) in many countries, including the United States. These pollutants are considered harmful to human health and the environment, and their levels in the atmosphere are monitored and regulated to protect public health and welfare. Criteria Pollutants, as defined by the US EPA are:

1. **Particulate Matter (“PM”):** This Criteria Pollutant category includes PM_{10} and $PM_{2.5}$. PM_{10} refers to particles with a diameter of 10 micrometers or smaller, while $PM_{2.5}$ refers to particles with a diameter of 2.5 micrometers or smaller. These particles can penetrate deep into the respiratory system and cause a range of health problems, including respiratory and cardiovascular disease.

2. **Ground-Level Ozone (“O_3”):** This Criteria Pollutant is formed when pollutants emitted by cars, industrial activities, and other sources react with sunlight. High levels of ozone can cause respiratory problems, exacerbate asthma, and contribute to other health issues.

3. **Carbon Monoxide (“CO”):** This is a colorless, odorless gas produced by the incomplete combustion of fossil fuels, such as gasoline, natural gas, and coal. It can interfere with the body’s ability to transport oxygen and can lead to symptoms such as headaches, dizziness, and even death (in high concentrations).

4. **Sulfur Dioxide (“SO_2”):** This gas is produced primarily by burning fossil fuels containing sulfur, such as coal, natural gas, and oil. It can lead to respiratory problems, particularly in people with asthma, and contribute to the formation of acid rain.

5. **Nitrogen Dioxide (“NO_2”):** This is a reddish-brown gas formed during combustion processes, such as those occurring in vehicles and power plants. Exposure to high levels of NO_2 can cause respiratory problems and worsen existing respiratory conditions.

VOLATILE ORGANIC COMPOUNDS

VOCs are organic chemicals that can easily evaporate into air at room temperature and can play a significant role in the formation of Criteria Pollutants such as O_3 and $PM_{2.5}$. VOCs are emitted from a variety of sources including vehicle exhaust, industrial processes, solvent use, and even natural sources such as vegetation. When VOCs react with nitrogen oxides ("NOx") in the presence of sunlight, they can contribute to the formation of fine particulate matter through chemical reactions in the atmosphere.

While VOCs themselves are not considered Criteria Pollutants, their emissions are regulated and controlled as part of air quality management efforts due to their role in the formation of Criteria Pollutants. Reducing VOC emissions can help mitigate air quality issues and protect human health and the environment.

EMISSIONS EVALUATIONS

Electrified Compression

To estimate the carbon intensity ("CI") and NOx emissions of electric compression, electricity consumption was calculated based on the rated horsepower of the RICE equivalent and using the conversion factor of 0.7457 kWh/hp. Carbon intensity of grid electricity is based on the EPA's eGrid system, which shows a CO_2 equivalent of 0.774 lbs CO_2e/kWh and NOx emissions of 7.0×10^{-6} lb/kWh for electricity generated in the Electric Reliability Council of Texas ("ERCOT") system (2022)[2].

RICE Compression

The CI of RICE compression is derived from Encino's internal database of Emissions Performance Test Reports; with measured concentrations collected using Fourier transform infrared spectroscopy ("FTIR") and calculated to be 0.79 lb/hp-hr CO_2 and 0.003 lb/hp-hr CH_4. Pursuant to the most recent guidance, methane is assumed to be 28X as potent a greenhouse gas as CO_2 in terms of global warming potential over 100 years[3]. The formula for CO_2 equivalency is shown below in ***Equation 1*** and the emissions factors for greenhouse gases and criteria pollutants are shown in ***Table 1***.

Equation 1: CO_2 Equivalency Calculation

$$CO_2e = CO_2 + GWP_{Methane} \, x \, CH_4$$

Where

CO_2e	Carbon dioxide equivalent: a unit of measurement used to express the global warming potential (GWP) of greenhouse gases (GHG) relative to carbon dioxide (CO_2).
CO_2	Actual (measured) carbon dioxide (CO_2) value – typically expressed in units of parts per million (ppm).
$GWP_{Methane}$	Global warming potential (GWP) of methane (CH_4) – with an intensity value of between 27 – 30 times that of carbon dioxide (CO_2).
CH_4	Actual (measured) methane (CH_4) value – typically expressed in units of parts per million (ppm).

[2] (Emissions & Generation Resource Integrated Database (eGRID), 2024)

[3] (Understanding Global Warming Potentials, 2024)

Table 1: Emissions Factors for Criteria Pollutants and GHG Species.

POLLUTANT	FACTOR	UNIT	SOURCE
CO_2	0.79000	lb/hp-hr	Based on Encino test data (2022)
CH_4	0.00339	lb/hp-hr	Based on Encino test data (2022)
NOx	0.00123	lb/hp-hr	Based on Encino test data (2022)
VOC	0.00091	lb/hp-hr	Based on Encino test data (2022)
CO	0.00064	lb/hp-hr	Based on Encino test data (2022)
HCHO (Formaldehyde)	$2.39817 \times E^{-05}$	lb/hp-hr	Based on Encino test data (2022)

Data Sources

Monarch representatives furnished the total operational hours in 2023 for each compressor type within their fleet, encompassing EcoFlex 800, 1500, and 2500 models. For the scope of this analysis, it is assumed that the engines functioned at full rated capacity, notwithstanding the company's assertion that they are capable of operating at levels as low as 50% of their rated capacity.

Table 2: Fleetwide Emissions Based on 2023 Usage Hours.

RATING (HP)	2023 HOURS	CO_2 TONS (RICE)	CH_4 TONS (RICE)	CO_2e TONS (RICE)	CO_2e TONS (ELECTRIC)	2023 REDUCTION (TONS)
EcoFlex 800	44,357	14,016.81	60.21	15,702.79	10,244.61	5,458.18
EcoFlex 1500	42,567	25,220.95	108.34	28,254.59	18,433.49	9,821.10
EcoFlex 2500	31,034	30,646.08	131.65	34,332.27	22,398.61	11,933.66
TOTAL	**117,958**	**69,883.83**	**300.21**	**78,289.65**	**51,076.72**	**27,212.93**

However, considering that all 14 of the EcoFlex 800, 18 out of 26 of the EcoFlex 1500, and 38 out of 41 of the EcoFlex 2500 compressor units were installed in 2023, a distinct analysis was conducted to ascertain the total reduction in GHGs if Monarch's 81-unit compressor fleet were to operate for an entire year (8.760 hours), as typically assumed in the Air Quality Permitting Process. The findings are presented in ***Table 3*** below.

Table 3: Fleetwide Emissions Based on 8,760 Hours Operating Time.

RATING	UNITS	CO_2 TONS (RICE)	CH_4 TONS (RICE)	CO_2e TONS (RICE)	CO_2 TONS (ELECTRIC)	2023 DELTA (Δ) (TONS)
EcoFlex 800	14	38,754.24	166.48	43,415.70	28,324.71	15,090.99
EcoFlex 1500	26	134,947.80	579.71	151,179.68	98,630.68	52,549.00
EcoFlex 2500	41	354,670.50	1,523.60	397,331.22	259,177.06	138,109.55
TOTAL	**81**	**528,372.54**	**2,269.79**	**591,926.61**	**386,177.06**	**205,749.54**

Monarch's electric compressors were compared on a per-unit basis to their RICE equivalents in the table below. Results are expressed in tons per year (tpy).

Table 4: Per-Unit Comparison of CO_2e and NOx Emissions on a Tons Per Year (TPY) basis.

MODEL	HOURS	CO_2e (TPY)	NOx (TPY)
Monarch EcoFlex 800	8,760	2,023.19	1.22
Caterpillar 3508 Series		3,101.12	4.31
Monarch EcoFlex 1500		3,793.49	2.29
Caterpillar 3516 Series		5,814.60	8.08
Monarch EcoFlex 2500		6,322.48	3.82
Caterpillar 3608 Series		9,691.01	13.47

Based on the assumptions above, electric compressors have the potential to achieve a **34.8%** reduction in greenhouse gas emissions and a **71.6%** reduction in NOx emissions compared to a traditional RICE compressor system. However, it's important to note that these figures may vary depending on the carbon intensity (CI) of the local grid. Monarch's NOx emissions are detailed in the subsequent section.

OTHER POLLUTANTS

The EPA's Emissions and Generation Resource Integrated Database ("eGrid") system provides statewide NOx emissions data, indicating that for the ERCOT system, NOx emissions were 0.000468 lb/kWh for all electricity generated in 2022. Encino's engine test database reveals a NOx emissions factor of 0.00123 lb/hp-hr. Utilizing the rated horsepower to kWh equivalent consumption method employed in previous calculations, the NOx emissions were determined. Encino-derived emissions factors for volatile organic compounds (VOCs), carbon monoxide (CO), and formaldehyde (HCHO) were also utilized to establish the potential to emit (PTE) for the selected (RICE) makes/models.

Although no publicly accessible data was located concerning grid-wide emissions for VOCs, CO, and HCHO, it's important to note that these compounds play a critical role in the formation of smog and acid rain and can pose health risks to humans, particularly in areas near facilities and stations utilizing RICE compressors. The outcomes of this analysis are presented below in two (2) datasets: the first reflecting hours provided by Monarch, and the second reflecting Monarch's compressor fleet operating continuously for a year (8,760 hours of operation).

Table 5: Criteria Pollutant Emissions Based on 2023 Hours.

RATING (HP)	NOx TONS (RICE)	NOx TONS (ELECTRIC)	VOC TONS (RICE)	CO TONS (RICE)	HCHO TONS (RICE)
EcoFlex 800	21.83	6.19	16.19	11.37	0.43
EcoFlex 1500	39.28	11.14	29.13	20.46	0.77
EcoFlex 2500	47.73	13.54	35.39	24.86	0.93
TOTAL	**108.85**	**30.87**	**80.70**	**56.68**	**2.12**

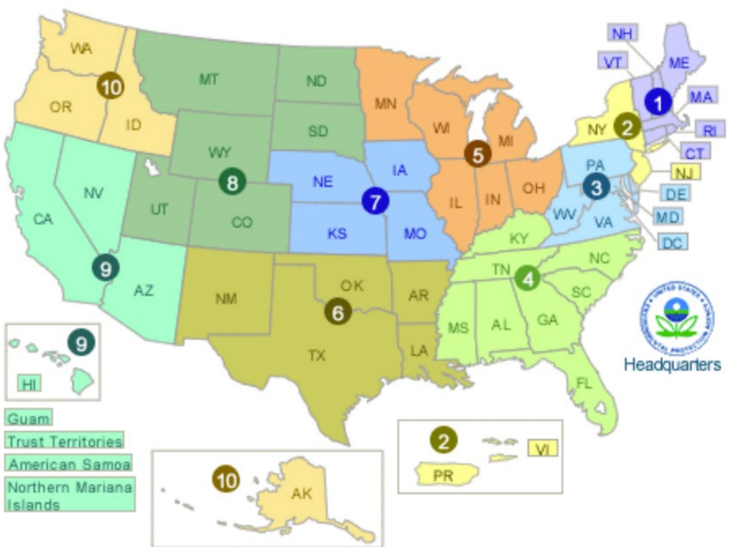
Table 6: Fleetwide Criteria Pollutant Emissions Based on Continuous Operation (1 year).

RATING (HP)	NOx TONS (RICE)	NOx TONS (ELECTRIC)	VOC TONS (RICE)	CO TONS (RICE)	HCHO TONS (RICE)
EcoFlex 800	60.36	17.12	44.75	31.43	1.18
EcoFlex 1500	210.19	59.61	155.84	109.46	4.10
EcoFlex 2500	552.41	156.68	409.58	287.68	10.77
TOTAL	**822.96**	**233.41**	**610.18**	**428.57**	**16.04**

CLEAN AIR ACT PERMITTING

The Federal Clean Air Act ("CAA") establishes several permitting programs designed to carry out the goals of the Act. Some of these programs are directly implemented by the EPA through Regional Offices; however, most are carried out by states, local agencies, and approved tribes. EPA Regions are identified in ***Figure 2***.

Figure 2: EPA Regions



1	New England
2	New Jersey, New York, Puerto Rico, US Virgin Islands
3	Mid-Atlantic
4	Southeastern
5	Great Lakes
6	South-Central
7	Midwest
8	Mountains and Plains
9	Pacific Southwest
10	Pacific Northwest

Utilizing electric compressor units over natural gas-fired RICE offers significant air quality permitting and reporting benefits in upstream and midstream gas production and transportation systems.

Electric compressor units produce zero on-site emissions during operation, unlike natural gas-fired RICE, which emit pollutants such as permittable Criteria Pollutants. By eradicating these emissions, electric compressors enhance air quality and alleviate the need for certain permit requirements, including monitoring and reporting.

Lower Emissions Fees

In many jurisdictions, companies are subject to emissions fees and taxes based on the amount of pollutants they release into the atmosphere. By using electric compressors (zero direct emissions), companies can significantly reduce or eliminate these fees. This provides significant cost savings regarding compulsory (regulatory) obligations while aligning with corporate sustainability goals.

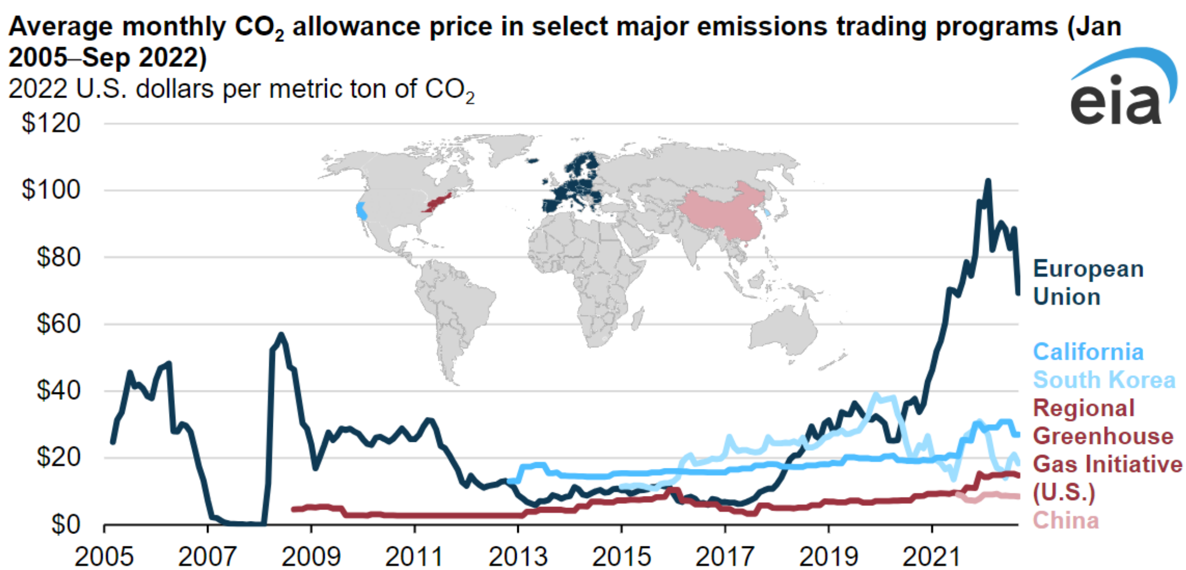
Additionally, liability and exposure regarding CO_2 Emissions Trading Systems is greatly reduced through the adoption of electric compressor systems. These trading outlets are typically government programs that regulate CO_2 emissions. Regulated entities – such as power generators and industrial firms can buy and sell CO_2 Emissions Allowances, which permit them to release a specified amount of GHGs.

Five of the largest emissions trading systems (by trading volume) in the world are:

- The European Union's Emissions Trading System (EU-ETS).
- The Korea Emissions Trading System (KETS).
- The California Cap and Trade Program.
- The Regional Greenhouse Gas Initiative (RGGI), covering certain states in the US Northeast and mid-Atlantic region.; and
- China's National Emission Trading System (China-ETS).

Global allowance prices for CO_2 emissions increased by over 40% in 2021[4]. Average monthly CO_2 allowance price in select major emissions trading programs from January 2005 to September 2022 is illustrated in Figure 3[5].

Figure 3: Global Allowance Prices for CO2 Emissions Over Time



[4] US Energy Information Administration (EIA), Independent Statistics and Analysis; December 13, 2022.

[5] Data Source; International Carbon Action Partnership. https://icapcarbonaction.com/en/ets-prices.

According to the Environmental Defense Fund ("EDF"), the current central estimate of the social cost of carbon is over $50/ton. The table below details the financial impact of the reductions offered by electrified compressor units utilizing a figure of $50/ton[6].

Table 7 – Financial Analysis of Carbon Exposure; RICE vs. Electrified Units

MODEL	CO_2e (TPY)	COST PER UNIT/YR ($)	ELECTRIC REDUCTION
Monarch EcoFlex 800	2,023.19	$101,159.68	$53,896.41
Caterpillar 3508 Series	3,101.12	$155,056.00	
Monarch EcoFlex 1500	3,793.49	$189,674.39	$101,055.77
Caterpillar 3516 Series	5,814.60	$290,730.00	
Monarch EcoFlex 2500	6,322.48	$316,123.99	$168,426.28
Caterpillar 3608 Series	9,691.01	$484,550.50	

Mitigation of Non-Compliance Risks

Non-compliance with emissions regulations can result in significant penalties and fines for companies. Utilizing electric compressors eliminates the risk of non-compliance associated with emissions from traditional combustion-based compressor units. This proactive approach lends benefits to companies by avoiding legal and financial repercussions, ensuring continued operations without interruption or reputational damage.

The CAA authorizes EPA to issue a unilateral compliance order or negotiate a compliance agreement with noncomplying federal facilities. EPA is also authorized to immediately bring suit or to take other action necessary against persons or facilities causing imminent and substantial endangerment to public health.

EPA may assess civil administrative penalties of up to $37,500 per day, per violation against federally regulated entities. EPA may also issue field citations of up to $7,500 per day, per violation for minor infractions[7].

Enhanced Reputation and Stakeholder Relations

Demonstrating a commitment to environmental responsibility by using zero-emission electric compressors can enhance a company's reputation and improve relationships with stakeholders, including regulatory agencies, local communities, investors, and customers. Companies perceived as environmentally conscious and compliant with emissions regulations are more likely to attract positive attention and support from stakeholders, which can lead to various benefits, such as access to capital, favorable regulatory treatment, and increased market competitiveness.

[6] https://www.edf.org/true-cost-carbon-pollution.

[7] (Clean Air Act Stationary Source Civil Penalty Policy, 1991)

WASTE STREAMS

RICE Compressor Units used in industrial applications (i.e., oil and gas extraction, processing, and transportation) generate various waste streams throughout their operation. These waste streams may include:

1. **Used Engine Oil:** RICE engines require regular maintenance, including oil changes, to ensure proper lubrication and cooling. The spent engine oil generated during oil changes is considered a hazardous waste due to its potential to contain heavy metals, hydrocarbons, and other contaminants[8].
2. **Coolant:** RICE engines use coolant to regulate engine temperature and prevent overheating. Over time, coolant can become contaminated with metals, corrosion inhibitors, and other pollutants, making it hazardous if not properly managed.
3. **Wastewater:** Industrial processes associated with RICE engines, such as engine cleaning and maintenance activities, can generate wastewater containing pollutants such as oil, grease, heavy metals, and cleaning agents (chemical compounds). This wastewater must be managed to prevent contamination of nearby waterways.
4. **Solid Waste:** Various solid wastes can be generated during RICE engine maintenance, including used oil filters, oil-soaked rags, air filters, and other disposable parts. These waste streams may contain hazardous materials and must be properly managed to prevent environmental contamination.
5. **Exhaust Gas Treatment Residues:** Some RICE engines are equipped with emission control devices such as catalytic converters or diesel particulate filters to reduce emissions from exhaust. These devices may generate residues or byproducts during operation or maintenance, which can require proper handling and/or disposal.

Overall, managing the waste streams generated by RICE engines in industrial applications requires careful consideration of environmental regulations and best practices to minimize impacts on human health and the environment. Proper waste management strategies, including recycling, treatment, and disposal, are essential to ensure compliance with regulations and protect environmental quality and human health.

COOLANTS AND LUBRICANTS

Another avenue for waste reduction arising from the adoption of electric compression, stemming from the absence of engine oil and coolant typically associated with a traditional RICE compressor. ***Table 7*** outlines estimated oil and coolant consumption derived from the manufacturer's recommended service interval of 1,000 hours for oil and yearly for coolant.

[8] (Boughton & Horvath, 2004)

Table 7: Fluid Consumption of an Equivalent RICE Compressor Fleet.

ENGINE RATING	COUNT	Oil			COOLANT		
		CRANKCASE VOLUME (GAL)	CHANGES/YR	OIL/YR	VOLUME (GAL)	CHANGES/YR	COOLANT/YR
EcoFlex 800	14	61	123	7,503	33	14	462
EcoFlex 1500	26	112	228	25,536	194	26	5,044
EcoFlex 2500	41	241	360	86,760	241	41	9,881
TOTAL			**711**	**119,799**		**81**	**15,387**

The removal of these fluids on-site could prevent the disposal and/or recycling of 121,815 gallons of motor oil and 15,775 gallons of coolant. Furthermore, eliminating the requirement for waste oil and coolant containers on-site could reduce the need for approximately 812 trips to and from locations annually.

Electric compressors having less ancillary equipment on location also reduces the number of loads delivered by truck required to set compressors on location. Assuming an average round trip of 300 miles, fuel economy of 6 miles/gallon (diesel fuel), and 10,180 grams CO_2/gallon diesel consumed results in reductions in the number of trips and the resulting emissions are shown in ***Table 8*** below:

Table 8: Trip Reduction Associated with Electric Compressor Substitution.

CONFIGURATION	2023 INSTALLATIONS	TRUCKS REQUIRED (RICE)	TRUCKS REQUIRED (ELECTRIC)	REDUCTION IN TRIPS	EMISSIONS REDUCTION (TONS)
EcoFlex 800	14	35	21	14	8.57
EcoFlex 1500	18	63	36	27	16.52
EcoFlex 2500	38	152	114	38	23.26
E-Skid	19	0	19	(19)	(11.63)
TOTAL				**60**	**36.72**

While emissions reductions linked to decreased traffic are relatively minor in comparison to compressor emissions themselves, fewer trips help mitigate health, safety, and environmental (HSE) risks associated with driving on oilfield roads and state highway infrastructure.

EXHAUST GAS TREATMENT RESIDUE

Electric motors reduce the need for catalysts in industrial applications by eliminating the combustion process, which is the primary source of emissions that require catalytic conversion.

Reducing catalyst usage, particularly those containing precious metals, in engines used for industrial applications can have various (positive) environmental, social, and governance ("ESG") impacts:

Environmental Impact

1. **Resource Conservation:** Decreasing the use of catalysts containing precious metals reduces the demand for finite resources such as platinum, palladium, and rhodium. This helps conserve natural resources and reduces the environmental impact associated with their extraction and processing, including habitat destruction, energy consumption, and water pollution.
    a. **Habitat Destruction:** Mining operations often require large-scale land clearing and excavation, leading to the destruction of natural habitats, including forests, wetlands, and biodiversity-rich ecosystems. This destruction can disrupt local ecosystems, displace wildlife, and contribute to loss of biodiversity.
    b. **Soil and Water Contamination:** Mining activities can release harmful pollutants such as heavy metals, acids, and toxic chemicals into soil and waterways. These pollutants can leach into surrounding soil and groundwater, contaminating water sources and posing risks to human health and aquatic life.
    c. **Air Pollution:** Mining operations generate significant air pollution through dust (particulates), diesel exhaust, and release CO_2 and SO_2 emissions. These pollutants can degrade air quality, contribute to respiratory problems, and have adverse effects on human health and the environment.
    d. **Water Consumption and GHG Emissions:** The extraction, processing, and refining of precious metals require significant energy throughput, primarily from fossil fuels. This can result in GHG emissions, contributing to climate-related issues. Additionally, the use of fossil fuels further exacerbates air pollution and environmental degradation.
    e. **Acid Mine Drainage:** In some mining operations, exposure to sulfide minerals to air and water can result in acid mine drainage, a highly acidic and toxic runoff that can contaminate surface (water) and groundwater resources. Acid mine drainage can have severe impacts on aquatic ecosystems, corrode infrastructure, and degrade water quality[9].
2. **Waste Reduction:** Catalysts containing precious metals become waste at the end of their useful life. By reducing catalyst usage, less waste containing precious metals is generated, thereby decreasing the need for disposal and potential environmental contamination and compliance liabilities.

[9] (Luis, et al., 2022)

Social Impacts and Safety

The working conditions in mines that extract precious metals, particularly in third-world countries, can be challenging and often pose significant risks to health, safety, and well-being of workers. Some common aspects of working conditions in these mines, along with their impacts on local governments, safety, and the economy, include:

1. **Health and Safety Risks:** Miners in these operations are exposed to various occupational hazards, including cave-ins, rockfalls, explosions, and exposure to toxic chemicals and dust. Lack of proper safety equipment, inadequate training, and poor infrastructure further exacerbate these risks, leading to a high incidence of accidents, injuries, and fatalities among mine workers[10].

2. **Poor Working Conditions:** Many miners in third-world countries work in harsh and inhospitable environments, often in extreme temperatures, confined spaces, and with limited access to clean water, sanitation, and healthcare facilities. Long hours, low wages, and lack of job security contribute to poor working conditions and labor exploitation.

3. **Environmental Degradation:** Mining activities can have significant environmental impacts, including deforestation, soil erosion, water pollution, and loss of biodiversity. Inadequate environmental regulations and enforcement in some third-world countries exacerbate these impacts, leading to degradation of natural resources and ecosystems, which can have long-term consequences for local communities and ecosystems.

4. **Social Impacts:** Mining operations can disrupt local communities, cultures, and livelihoods, leading to social tensions, conflicts, and displacement of indigenous peoples and marginalized groups. Additionally, influxes of migrant workers into mining areas can strain local infrastructure and services, leading to increased pressure on housing, healthcare, and education systems.

5. **Economic Dependency:** Many third-world countries rely heavily on revenues from mining activities to support their economies, fund government services, and generate employment opportunities. However, dependence on mining can create economic vulnerabilities, as fluctuations in global commodity prices and market demand can impact the stability and sustainability of local economies.

6. **Governance Challenges:** Weak governance structures, corruption, and lack of transparency in some third-world countries can exacerbate social, environmental, and economic challenges associated with mining activities. Inadequate regulatory frameworks, limited oversight, and enforcement capacity can result in exploitation, human rights abuses, and environmental degradation, undermining efforts to promote sustainable and responsible mining practices.

   Additionally, illegal mining and trafficking of precious metals negatively impact peace, stability, security, development, governance, rule of law, the environment, and the economy. Furthermore, illegal mining of precious metals is often accompanied by serious human rights abuses. Illegal mining and trafficking of precious metals are often linked to economic crimes such as tax evasion, fraud, and corruption, by

[10] (Sepadi, Chadyiwa, & Nkosi, 2020)

exploiting loopholes in regulatory frameworks. Due to the high profits associated with precious metals, and the often-low risks of being arrested or prosecuted, organized criminal groups are exploiting this sector[11].

Quantifying the potential environmental and social impact of mining, as well as the upstream processing and refining of precious metals, poses significant challenges. Nevertheless, any service or product that reduces the consumption of these materials contributes positively to the overall health of the planet and the well-being of social systems.

PROFESSIONAL DEVELOPMENT AND COMMUNITY ENGAGEMENT

At Monarch, our goal is to build a team of leaders both within our industry and our surrounding communities. To achieve these goals, we place a strong emphasis on the professional development of our employees and community engagement. We invest in our employee’s professional development through extensive training programs that provide our employees the opportunity to hone the skills to succeed in their current roles, as well as develop new skills to tackle future challenges. We also invest in our communities by donating our time and resources to local charitable organizations. The health and development of our employees and the local communities that support Monarch are critical to our long-term, sustained success.

PROFESSIONAL DEVELOPMENT

Monarch’s focus to be the best-in-class contract gas compression provider in North America requires us to hire, develop, and maintain best-in-class employees. As a young company, we are focused on building a solid foundation of industry and company knowledge while also planning for the best growth pathways and training environment for our employees in all roles.

Our 3-tier approach in training focuses the development on safety, technical training, and professional growth. Safety training is crucial for every stakeholder. The know-how to safely complete a job protects our employees, the environment, Monarch’s equipment, and our customer’s natural resources. Technical training provides our employees with hands-on experience with Monarch-specific EcoFlex™ and E-Skid™ equipment and various Monarch systems. Investing in technical training provides our employees with a road map to help them each achieve success in their current position as well as develop the necessary skills to move into other positions in the future.

[11] (United Nations Office on Drugs and Crime, 2019)

EMPLOYEE BENEFITS

Monarch provides a comprehensive benefits package for all employes. Some of those benefits include (but are not limited to) company-paid health insurance for the whole family, fitness/gym stipends, monthly family meals, and various wellness challenges/programs.

Monarch also offers each employee the opportunity to participate in a 401k plan with a company-matching incentive. We believe that investing in our employees' future is important for the longevity of employment and to continue to build a culture that places the value of our employees and their families first.

COMMUNITY ENGAGEMENT

Throughout the year, Monarch supports local charitable organizations to help give back to the communities that our employees live in and where we operate. Engaging in different local community service opportunities helps to develop a sense of pride and selflessness for our employees, as many of them have a personal or familial connections to these organizations. Monarch regularly donates our time and resources to organizations such as local food banks, the Salvation Army's Angel Tree program, local youth sports associations, various 4-H and FFA Clubs, local public schools, community outreach events (for disadvantaged youth and their families), and participation in other various non-profit events.

SAFETY

In 2023, Monarch worked a total of 83,007 man-hours without a single injury. This resulted in a Total Incident Recordable Rate of 0.00. Statistically, companies in the compression industry would expect to have an average recordable rate of .9. This is a phenomenal safety record based on both the nature of our work and the conditions we work under.

Monarch's primary operations occur in the Permian Basin, which has been documented as the most dangerous place to drive in both Texas and New Mexico. More than half of the incidents documented involve multiple vehicles, with the rate of fatalities of multi-vehicle collisions being three times higher than any other part of the state. Monarch employees drove a total of 1,357,162 miles while recording zero incidents in 2023 (with most of these miles being driven in the Permian Basin). This is a true testament to our employees' unwavering commitment to safety and their dedication to following the policies and procedures we have in place.

SUMMARY AND CONCLUSION

Utilizing electric-driven compression over internal combustion engine incumbents offers many benefits – both social and environmental.

1. **Reduction of Greenhouse Gas and Criteria Pollutant Emissions**: Electric compressors have the potential to significantly reduce greenhouse gas emissions and nitrogen oxide (NOx) emissions compared to traditional RICE compressor systems. The reduction in greenhouse gas emissions by 34.0% and NOx emissions by 71.3% underscores the environmental advantages of electric-driven compression.
2. **Minimization of Waste Streams:** Unlike RICE compressor units, electric compressors do not require engine oil changes, resulting in the elimination of used engine oil as a waste stream. Similarly, coolant, which can become contaminated with pollutants over time, is not needed for electric compressors, reducing the generation of hazardous waste. Additionally, electric compressors do not produce wastewater or solid waste during operation, further minimizing environmental impacts associated with waste management.
3. **Reduced Dependency on Exhaust Gas Treatment:** Electric compressors do not require emission control devices like catalytic converters or diesel particulate filters, which can generate residues or byproducts requiring proper handling and disposal. By eliminating the need for these devices, electric compressors simplify maintenance and reduce the generation of additional waste streams.

The combination of environmental benefits, such as reduced greenhouse gas emissions and minimized waste streams, along with lower safety exposure due to decreased maintenance frequencies and the absence of precious metals catalysts, offers a positive impact on both social well-being and environmental sustainability. In addition to the positive impact on environmental sustainability, Monarch has built a company culture and environment that centers on family, service, safety, employee growth, and community engagement. Together, this has allowed us to establish ourselves as a gas compression industry leader devoted to sustainability.

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