Mexico's Energy Problem



Mexico's energy sector has a problem. In order to satisfy growing demand for high value transportation fuels, such as gasoline and diesel, Mexico must import billions of dollars' worth of these fuels each year.

Imports alone are not sufficient to meet Mexico's needs, so the country's oil refineries have been required to increase their output to make up the shortfall. As well as boosting transportation fuel supply, increased refinery output has inadvertently led to an oversupply of heavy fuel oil ('HFO'), which is primarily used in the power sector. With the government's focus on energy security, this surplus HFO must be sold off cheaply to the domestic power market or exported, costing the country billions of dollars in lost revenues each year and hindering Mexico's ability to reduce emissions and fulfil its climate goals.

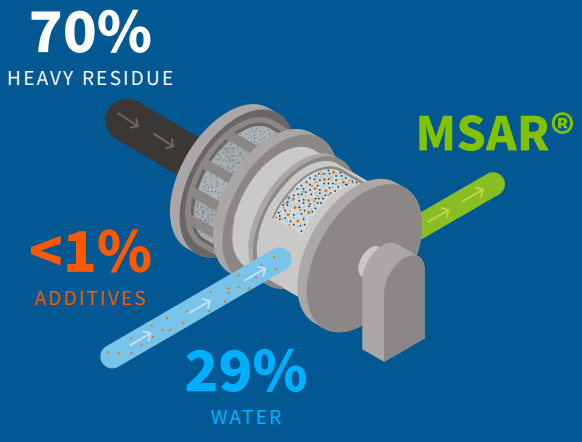
If Mexico is unable to quickly realign its energy infrastructure to produce more of the high value transportation fuels that it needs without creating excess HFO, it will continue to lose billions of dollars of revenue each year and will lose thousands of jobs as inward investment declines along with the country's economy. Furthermore, if power plant emissions are not reduced, the country risks being left behind by its global peers, with a transition to a low carbon economy potentially delayed by decades.

The MSAR® Solution

Mexico is in urgent need of an energy solution that allows it to rapidly rebalance refinery output away from HFO and towards higher value transportation fuels, so that the country can:

- Reduce its imports of diesel and other transportation fuels;
- Maximise the economic value of its oil reserves; and
- Meet its obligations to reduce carbon and other harmful emissions

Quadrise's MSAR® technology enables Mexico to achieve all of these objectives. This technology is proven, affordable and can be implemented immediately.



Quadrise

What is MSAR®?

MSAR® technology allows refiners to increase their diesel output whilst decreasing the amount of HFO that they produce.

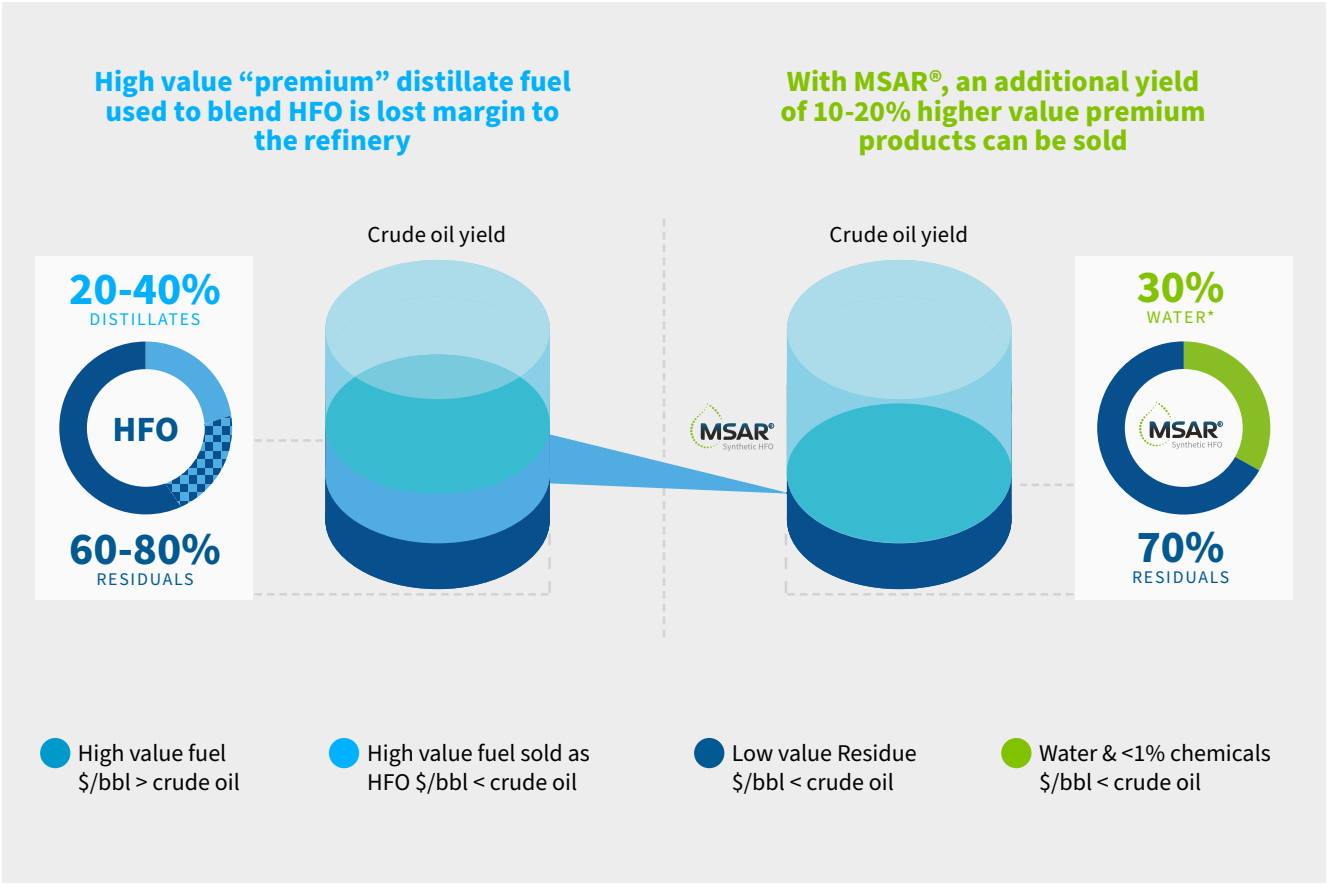
In order for oil refineries to realise value from the heaviest oil products refined from the bottom of the crude barrel, these viscous residues must be diluted with diesel to produce HFO. MSAR® technology allows refiners to use water instead of diesel as the diluent. The diesel can then be sold at full market value. Instead of HFO, a synthetic fuel oil called **MSAR®** is produced.

MSAR® is a proven fuel offering substantial economic and environmental benefits such as reduced particulate and NOx emissions, and lower CO_2 emissions through improved efficiency when used in industrial and marine diesel engines.

MSAR® technology converts heavy residues into micro-droplets of emulsion fuel, and then uses low value, treated water-streams and proprietary additives (supplied by our partner Nouryon) to produce MSAR®, a stable oil-in-water emulsion fuel.

Unlike other upgrading solutions for refineries, MSAR® technology can be implemented in under 12 months, at very low cost and without the increases in greenhouse gas emissions which accompany conventional refinery upgrading technology. MSAR® blending is modular, allowing for "plug and play" upgrading capability.

MSAR® technology and fuel has inherent environmental and economic benefits for refiners and consumers. It is the fastest and cleanest way of upgrading heavy oil value in a refinery, delivering increased savings and lower CO_2 emissions than alternative refinery upgrading technologies at the lowest cost.



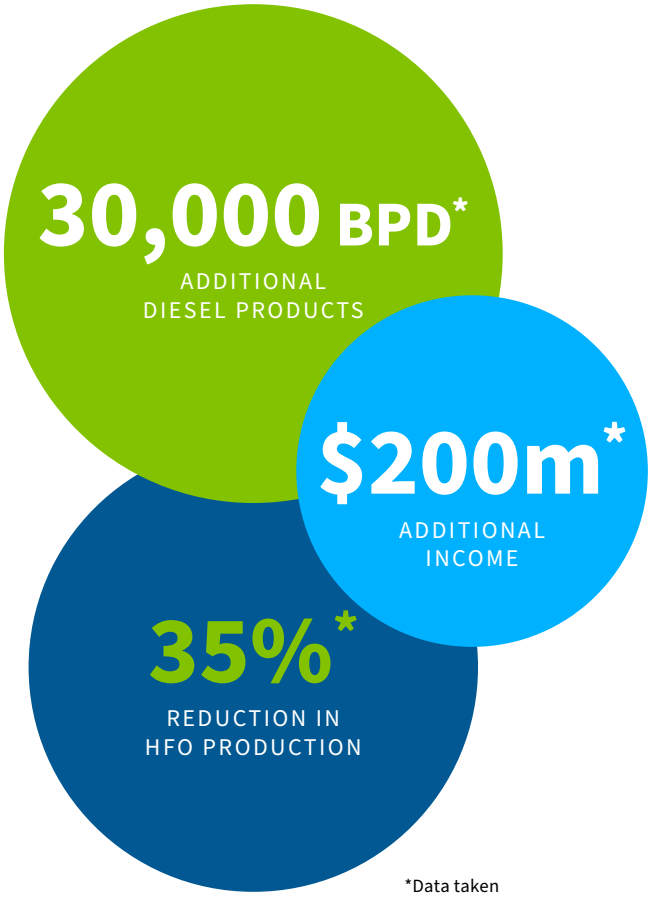
Economic Advantages

Deploying MSAR® technology at oil refineries in Mexico immediately unlocks significant value for refiners, energy consumers and the country by improving the profitability of downstream assets.

For Mexican refineries producing fuel oil today, MSAR® technology can create value by improving refinery yields and margins. Substituting 80,000 BPD of fuel oil production at one refinery in Mexico with MSAR® production **would result in 30,000 BPD of additional diesel products**, which can then be sold as transport fuels or blend-stocks, generating additional income of over **US$200m each year**. In addition, use of MSAR® technology allows refiners to reduce their production of uneconomical HFO **by over 35%**.

The ability of refiners to increase their production of high value transportation fuels allows Mexico to reduce its imports of these fuels. Additionally, MSAR® additives could potentially be produced in Mexico, leading to new investment and jobs in the petrochemical sector.

As MSAR® fuel has lower viscosity than HFO, energy costs arising due to fuel transport and storage for producers and consumers would also be reduced. Economic value is also delivered for energy consumers, with increased refinery yields delivering MSAR® fuel with lower fuel costs and emissions – enabling new sustainable energy investments.

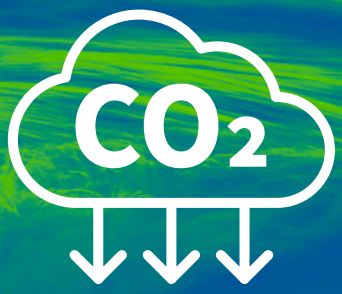


*Data taken from single refinery

Environmental Benefits

Use of MSAR® fuel in the power, heavy industry and marine sectors provides substantial emission savings due to improved combustion efficiency.

Fuel savings can be invested in emissions control equipment to benefit local communities and the environment. The reduction of fuel consumption by using MSAR® in large modern diesel engines provides CO_2 savings of up to 9% for the marine sector.



In addition, the lower combustion temperature of MSAR® reduces NOx emissions, and the micro size of fuel droplets results in much lower particulate emissions of black soot due to their near-complete combustion.

MSAR® technology can also be used to produce a lower cost biofuel called bioMSAR™, that incorporates renewable glycerine (a by-product of biodiesel manufacture) to reduce CO_2 emissions by 20-50%, assisting in the transition to a net-zero carbon future without any major changes in infrastructure.

Experienced Management Team



Members of the Quadrise management team were involved for over a decade in BP and PDVSA's 100,000 BPD Orimulsion® emulsion fuel business, which supplied more than 60 million tons of Orimulsion® fuel to base load power plants worldwide.

Building on the platform provided by Orimulsion® to develop MSAR®, Quadrise has undertaken extensive work with global power companies, marine operators and diesel engine manufacturers to demonstrate that MSAR® and bioMSAR™ fuel can be used effectively, with only minor adjustments to existing infrastructure required.

Quadrise is proud to have been active in Mexico and in Latin America for over 15 years. During this time Quadrise has formed strong relationships with local partners and key companies in the refining, power and utility sectors supported by GE Steam Power and Wärtsilä.



Jason Miles

Chief Executive Officer

Jason spent the first twelve years of his career developing fuel projects as a Process Engineer for BP, and subsequently for PDVSA as Business Development Manager where he implemented numerous Orimulsion power projects globally. Jason joined Quadrise in 2006 and now has some 25 years' technical and commercial experience in the emulsion fuels industry. Jason is a chartered Chemical Engineer with an honours degree in Chemical Engineering from Loughborough University and an Executive MBA from the Cass Business School in London.

Next Steps

A commercial scale trial is the precursor to wider deployment of MSAR® technology, demonstrating the proven economic and environmental performance of the technology and fuel. A trial and commercial deployment could be achieved in under 12 months, delivering significant and immediate benefits to the Mexican energy sector, and to the nation.

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