

ALFALUZ: SOLUTION OVERVIEW

Disrupting the
Economics of Bitumen &
Heavy Oil Production



ALFALUZ: AN INTRODUCTION

We're an innovative engineering and manufacturing company with a disruptive technology bringing economical and green solutions to the production and commercialization of bitumen and heavy oil.

Over the course of the past few years, we have perfected our proprietary M-CRACK and Workhorse® Systems. These systems instantaneously breaks stable emulsions, reduces or eliminates H₂S content, separates asphaltenes, sulfur, solids and other contaminants, resulting in a dramatic reduction of viscosity, density and acidity without using diluents, heat or other chemicals. It's a simple system, with low Capex and Opex, that produces pipeline-ready oil.

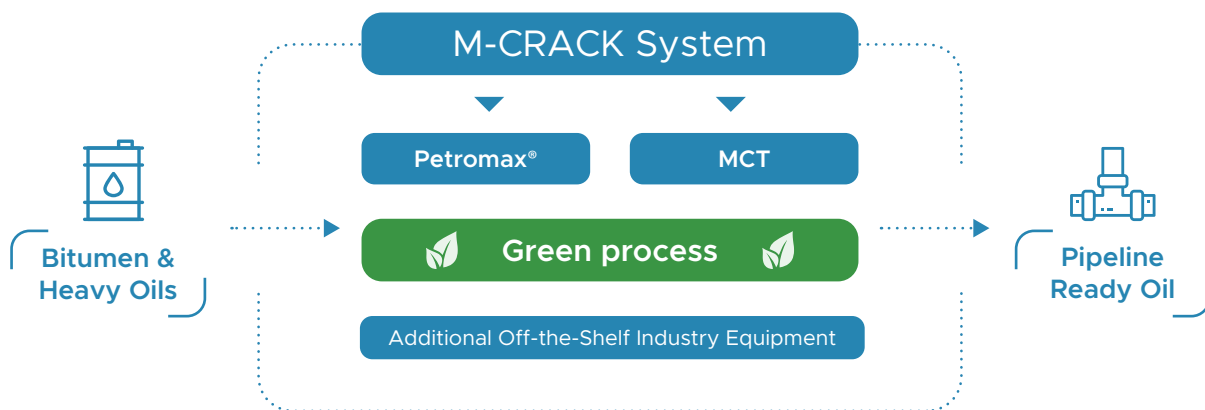
Designed to maximize the many benefits of Petromax®, our green “plug and play” M-CRACK system is installed directly in line with the operator's production process, with little or no change in equipment or infrastructure. Bitumen and heavy oils, combined with Petromax® and water at ambient temperature, decrease in density and viscosity as they move through the system.

The M-CRACK process consists of the combination of special purpose equipment and our proprietary chemical Petromax® working together. The M-CRACK process reverses the charge of the particles in the crude oil emulsion. The resulting repulsion between oil, solids and heavy contaminants instantaneously breaks the water/oil and oil/water emulsion, leaving the solids free of oil, eliminating the H₂S and separating the oil. The remaining salts and heavy metals then move to the water phase, and the remaining solids - including resins, asphaltenes, sulfur, crystalized paraffin, heavy metals and crystalized salt - are separated to a significant degree and drop out.

The three outputs of our three-step M-CRACK system are:

1. Clean water that is separated and recirculated within the M-CRACK system and the Central Processing Facility (CPF)
2. A lighter, more valuable and pipeline-ready commercial oil processed with negligible environmental impact
3. Cleaned solids

Our unique M-CRACK system is comprised of standard industry equipment and proprietary components that make the magic happen





SOLVING OIL SANDS & TAILINGS POND CHALLENGES

Unconsolidated sandstone deposits known as oil sands are comprised primarily of sand, clay and water saturated with bitumen.

Bitumen is a **highly viscous and extra heavy hydrocarbon** with an average API gravity of 8°. It can be separated into two organic compounds: **asphaltenes and maltenes**.

Asphaltenes have a heavy molecular structure, imparting a high viscosity and density to the oil. They contain nickel, sulphur, vanadium, and ultra-fine particles that reduce the quality of the produced crude oil and make it expensive and difficult to transport and refine.

The main challenge facing mining operations is obtaining higher profit margins from bitumen without generating toxic tailing ponds, for which the Workhorse® is used. For thermal operations (SAGD and others) the challenge is to avoid requiring large amounts of diluent and chemicals, and to reduce CO2e emissions and energy costs. For these applications, the M-CRACK is used.

The Workhorse® system is the answer

Bitumen & heavy crude consists of tightly bound solids



“IMPOSSIBLE” WAS NOT AN OPTION

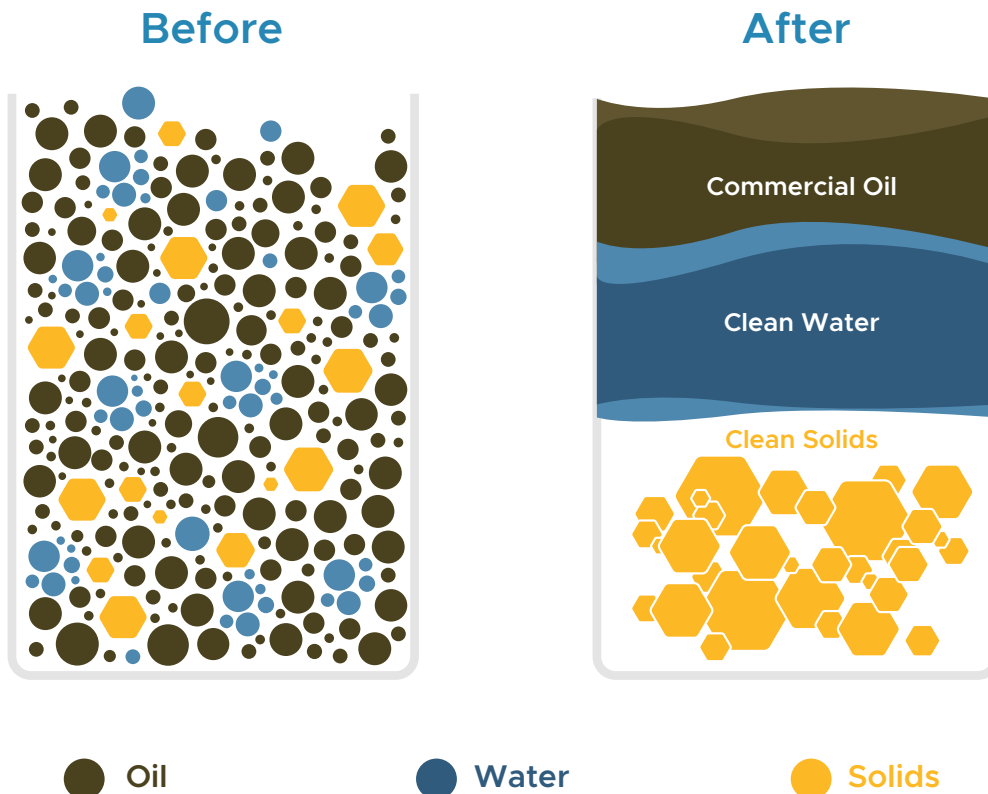
We set out to achieve something that had never been done in the industry: Create a cost-effective system that quickly and economically transforms bitumen and heavy crude oils into pipeline-ready oil during the production process, with negligible or no environmental impact.

Sound impossible?
It was.

Then we showed up.

Our unique in-line M-CRACK system consists of the combination of our proprietary non-toxic, biodegradable Petromax® chemical working together with our unique injection unit and MCT separator and with additional economical, off-the-shelf equipment. This system instantaneously breaks the emulsion and quickly transforms bitumen and heavy oils into pipeline-spec commercial oil without diluents. Our system cuts costs, increases value, and generates higher profits while dramatically reducing the environmental footprint.

Visit us at alfaluz.ca to learn more.



HOW WE DO IT?

WE BREAK STUFF

Our plug-and-play M-CRACK system is much faster, more economical, and more effective at doing what other companies spend millions of dollars trying to accomplish:

WE INSTANTANEOUSLY BREAK THE EMULSION

MFT

The M-CRACK is the only system in the world that effectively breaks the emulsion of toxic MFT tailings at ambient temperature, allowing quick and economical separation of the fines, extraction of bitumen and leaving clean water.

SAGD and Other Thermal

The M-CRACK instantaneously breaks the emulsion at the wellhead pad, allowing fast and economical separation and partial upgrading with little or no carbon emissions.

Heavy Oil Production

The M-CRACK instantaneously breaks the emulsion and partially upgrades the oil in a simple, fast and economical process, adding substantial value to the oil.

MAIN BENEFITS OF THE M-CRACK SYSTEM



Reduces operating costs



Increases production capacity because diluent eliminated



Reduces viscosity and density of the sales oil stream



100% Green: Water-based, non toxic, biodegradable, no CO₂ emissions



No diluents required, increasing pipeline oil volume



Fast, easy to apply, and economical



Eliminates H₂S



Partially upgrades to pipeline-spec requirements



Significantly increases profit margins



Significantly reduces sulfur, asphaltenes, salts, heavy metals, toxins



Works at ambient temperatures



Uses economical, readily-available equipment: Low Capex

System Outputs



Pipeline-Ready Commercial Oil



Clean Recovered Water



Cleaned Solids

A GREAT WAY TO INCREASE PROFITABILITY

Petromax® Environmental Benefits



No heat
required



Non toxic



Biodegradable

M-CRACK System Environmental Benefits



Significantly
reduces

- Sulfur - Asphaltenes
- Salts - Heavy metals
- Toxins - H₂S



No diluents
required



Reduces
greenhouse
gas emissions



Substantially
reduces
pollution
caused by oil
processing



Dramatic
reduction of
water
consumption



Elimination of
toxic tailings in
ore processing



Dramatic reduction of
CO₂ emissions



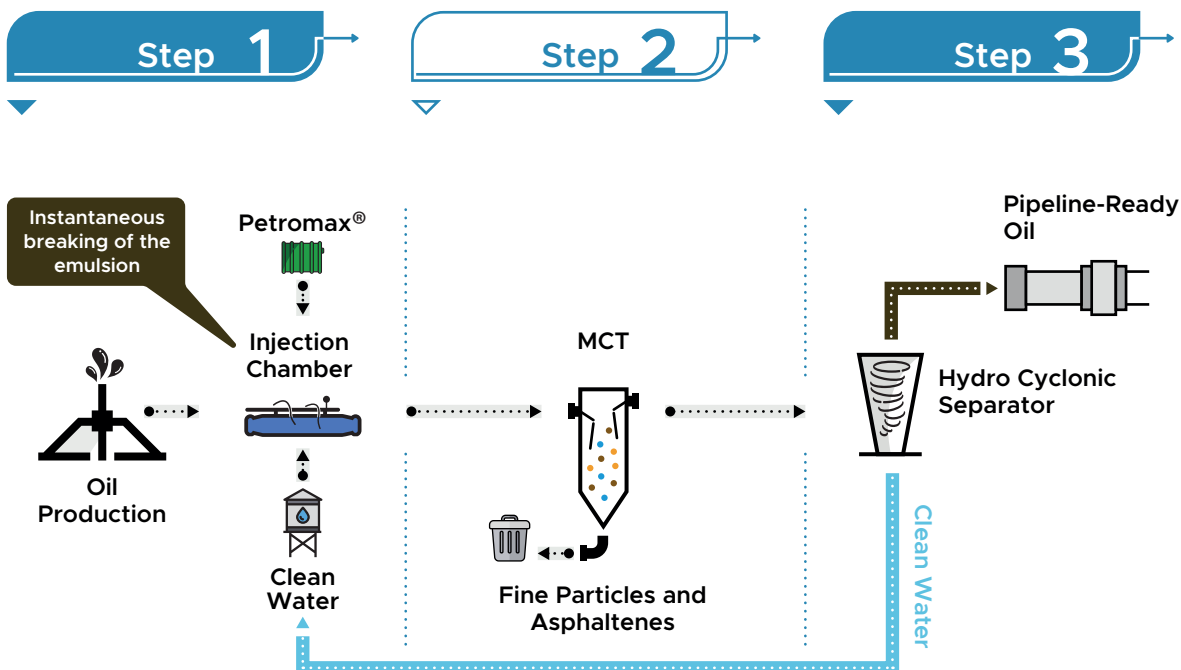
Significant energy
savings

OUR M-CRACK SYSTEM

Alfaluz's cost-effective and 100% green M-CRACK system quickly separates contaminants from bitumen and heavy oil during the production process without the use of diluents or blending, resulting in increased yield that is pipeline-ready.

The M-CRACK accomplishes this in three steps:

- Step one breaks the emulsion**, eliminates H_2S , and temporarily reduces the viscosity and density of bitumen and heavy oil by hydro-blasting the bitumen and heavy oil with a mix of water and Petromax®. No diluents or heat is required.
- Step two** separates solids, sulfur, asphaltenes, crystalized paraffin, heavy metals and some salts, resulting in a lighter oil with lower viscosity, lower density, and fewer contaminants.
- Step three** separates the oil from water, resulting in three valuable outputs:
 - 1) Commercial oil at pipeline-spec.
 - 2) Clean water which can be recirculated within the M-CRACK system, or used as processed water without the need for additional expensive treatments.
 - 3) Cleaned solids



STEP 1: IT ALL STARTS WITH BREAKING THE EMULSION

The first step instantaneously breaks the emulsion by changing the bond between the inorganic particles and the hydrocarbons.

Once the electric charge changes to a negative state in the inorganic particles in the injection chamber, the particles and the hydrocarbons **instantly repel each other**, forming a pumpable slurry.

The pumpable slurry contains **no H₂S, and oil free of solids and water, with Petromax®, crystallized salts, and heavy metals suspended in the water phase.**

What Happens During Step 1

The M-CRACK injection unit hydroblasts Petromax® into the bitumen instantaneously breaking the emulsion with the following effects:

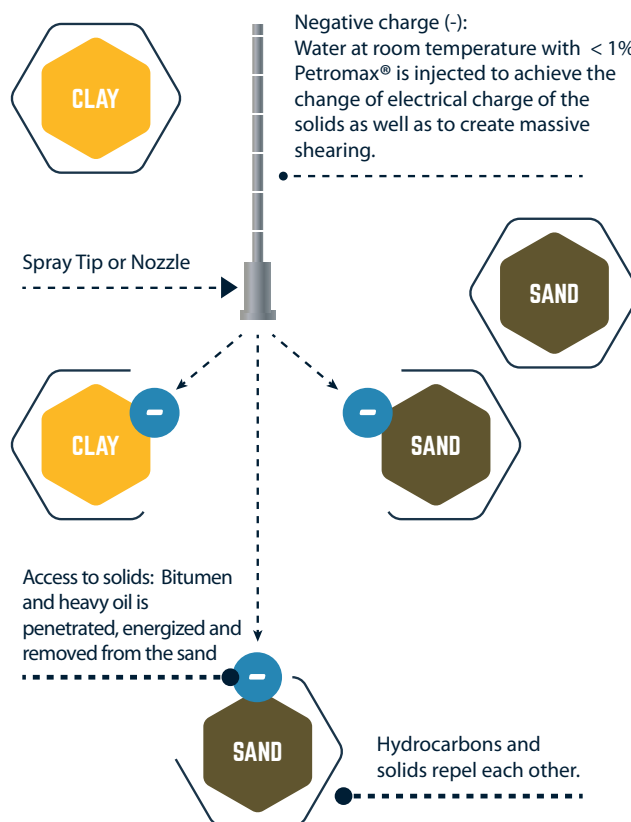
High-Pressure Penetration:

The resins that are covering the solids are penetrated by force and the strong bond with solids is broken (clay, sand, quartz, asphaltenes, others).

Mixing at High Pressure:

The solids are energized in order to create a flow in which the most complicated compounds will be suspended and uniformly dispersed (colloidal dispersion).

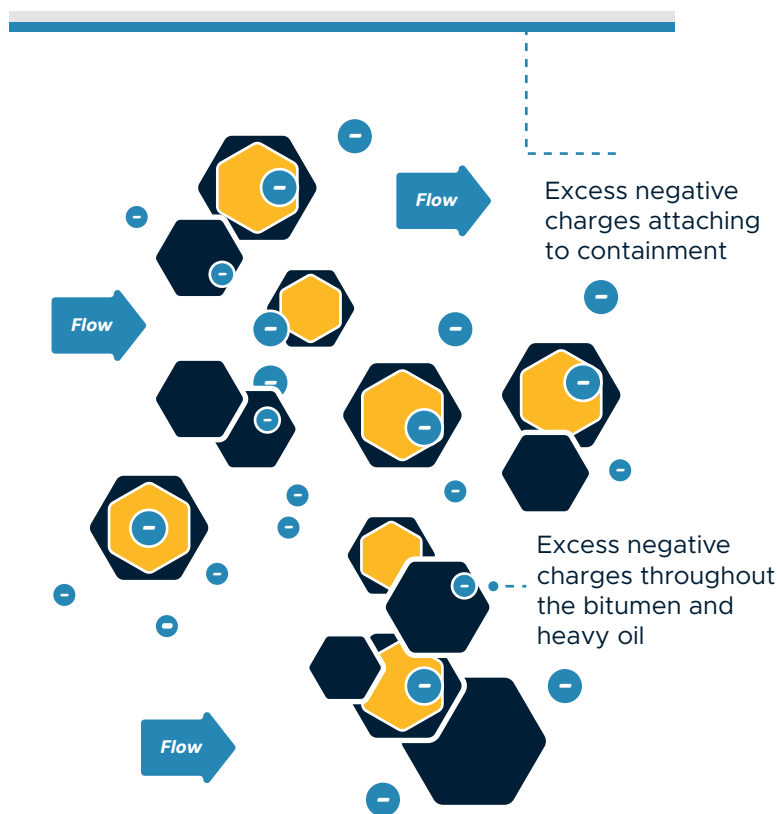
The shearing breaks the weaker bonds so Petromax® can encapsulate the solids such as the heavy molecular weight asphaltenes, some paraffin and heavy metals, so they will drop from the flow in the next step.



STEP 1 RESULTS: THE LESS DENSE, NON VISCOUS FLUID IS PRE-SEPARATED

The injection chamber conditioning process produces an excess negative charge throughout the bitumen and heavy oil that will be used in the next step.

At the end of this first step, we see a very homogeneous thick, dark, pumpable liquid.



When Petromax® touches the walls of pipes, hoses and equipment, it protects them from further attachment of hydrocarbons due to its repellency characteristic.

STEP 2: ELIMINATE FINE PARTICLES & TOXIC MATERIALS

On average 50% of the asphaltenes are diluted and encapsulated by Petromax®, so they will be separated along with the sand and other fine and ultra-fine particles in the MCT unit during Step 2.

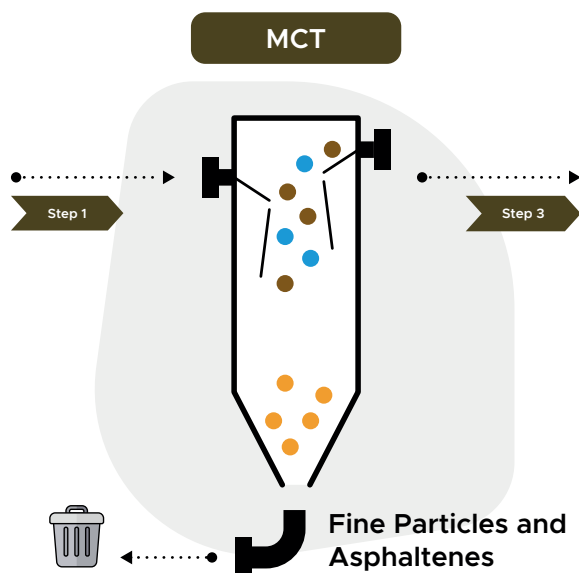
The slurry coming from the first step has the following improved characteristics:

- ✓ The emulsion has been broken
- ✓ The solids and the hydrocarbons have been separated
- ✓ Fine particles, some resins, some paraffin and black powder are suspended in the fluid (colloidal dispersion)

What Happens During Step 2

Step 2 of the M-CRACK system uses our proprietary hydro-cyclone MCT unit to separate fine particles, heavy metals, salts, asphaltenes, sulfur and black powder from the colloidal dispersion.

The MCT unit uses a number of advanced and proven forces to do it's magic.

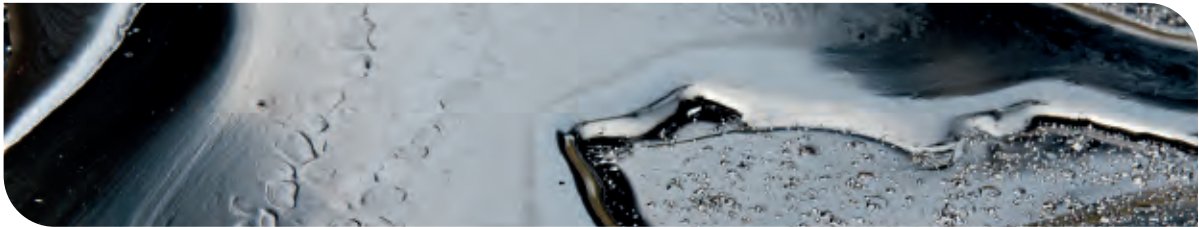


What flows from Step 2 to Step 3 is a lighter, **cleaner oil mixed with water**.

STEP 3: SEPARATE WATER FROM PIPELINE-READY OIL

The fluid coming from the MCT in Step 2 has permanently reduced density, viscosity, H₂S, and other contaminants.

It is a mix of cleaner and softer water with lighter oil (API gravity over 19).



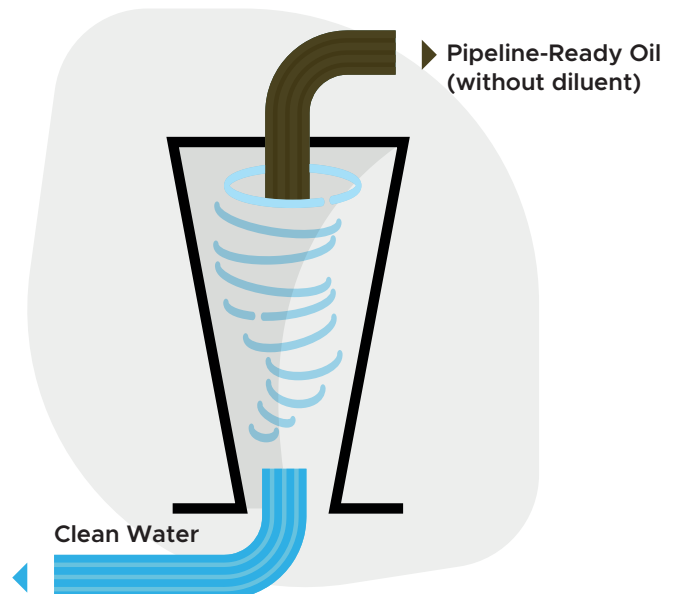
What Happens During Step 3

Hydro Cyclonic Separator

During Step 3, the clean oil and water brought over from the MCT are separated using a highly efficient, off-the-shelf hydro-cyclone.

The result is two very valuable products that are created without using heat or diluents:

- ✓ Pipeline-ready commercial oil with no diluent added.
- ✓ Clean water ready to recirculate within the M-CRACK system, and / or use as processed water without the need for additional treatment.





ALFALUZ

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