

Versatile Mobile Energy Independent  
Cleaning System

# MegaMACS

10 - Years of Innovations



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# KMT INTERNATIONAL, INC PRESENTS MOBILE ENERGY INDEPENDENT SYSTEM MEGAMACS

## KMT INTERNATIONAL, INC.'S HISTORY & PRODUCT

KMT International, Inc. is an engineering/manufacturing company founded in 1999. In 2006 KMT has join with company IDF, California in effort to create the best cleaning system for oil industry. Our headquarters and manufacturing facilities are located in California, USA. Main company focus is on petrochemical industry and we offer various environmentally friendly technologies for oil tank cleaning, sludge processing, soil remediation, reservoirs cleaning and industrial wastewater treatment. Our comprehensive solution allows completely resolve environmental and technological problems related to liquid and solid oil waste. Our MegaMACS system is unique and widely used for oil tanks cleaning in upstream and downstream operations in oil industry.



System performs de-slugging, oil recovery and tank washing during oil tank cleaning in one continuous process. MegaMACS is extremely safe and highly productive. During many years of using this technology around the globe, more than 1500 tanks were cleaned. Use of additional auxiliary equipment will allow cleaning many other oil and sludge holding vessels. MegaMACS is very versatile system and able to clean ships, barges, sludge collection pits and lagoons, various petrochemical holding reservoirs, etc. When used for crude oil tank cleaning our system delivers outstanding results in the compact, mobile, and energy independent package.



MegaMACS Main Process Unit ready for pick up at KMT (IDF) facility in Stockton, California.

## HOW DOES IT WORK (SHORT PROCESS DESCRIPTION)

You may see a process flow diagram of crude oil tank or small pit cleaning on the next page.

These applications are the most common where MegaMACS is typically used for.

Depending on tank size and some other conditions Robotic Cannon or Sludge Extractor are used for sludge removal. Floating pontoon is used for sludge removal in case big pits are cleaned.

Usually for reservoirs cleaning the best cleaning agent is water. The system employs Three-Phase centrifuge to separate extracted sludge into three phases oil, water and solid.

Following is a description of the cleaning process using water as a cleaning agent.

In preparation for cleaning process, main process tank is filled with 25 m<sup>3</sup> of water which then is heated to 185°F (85°C) by recirculating water with wash pump through heat exchanger. Robotic Cannon on a tripod installed inside the tank with booster pump placed in front of it to receive diluted sludge and pump it to the MAgA MACS Main Unit.

## SPECIAL ANNOUNCEMENT

Vestibulum vel orci in arcu elementum lacinia.

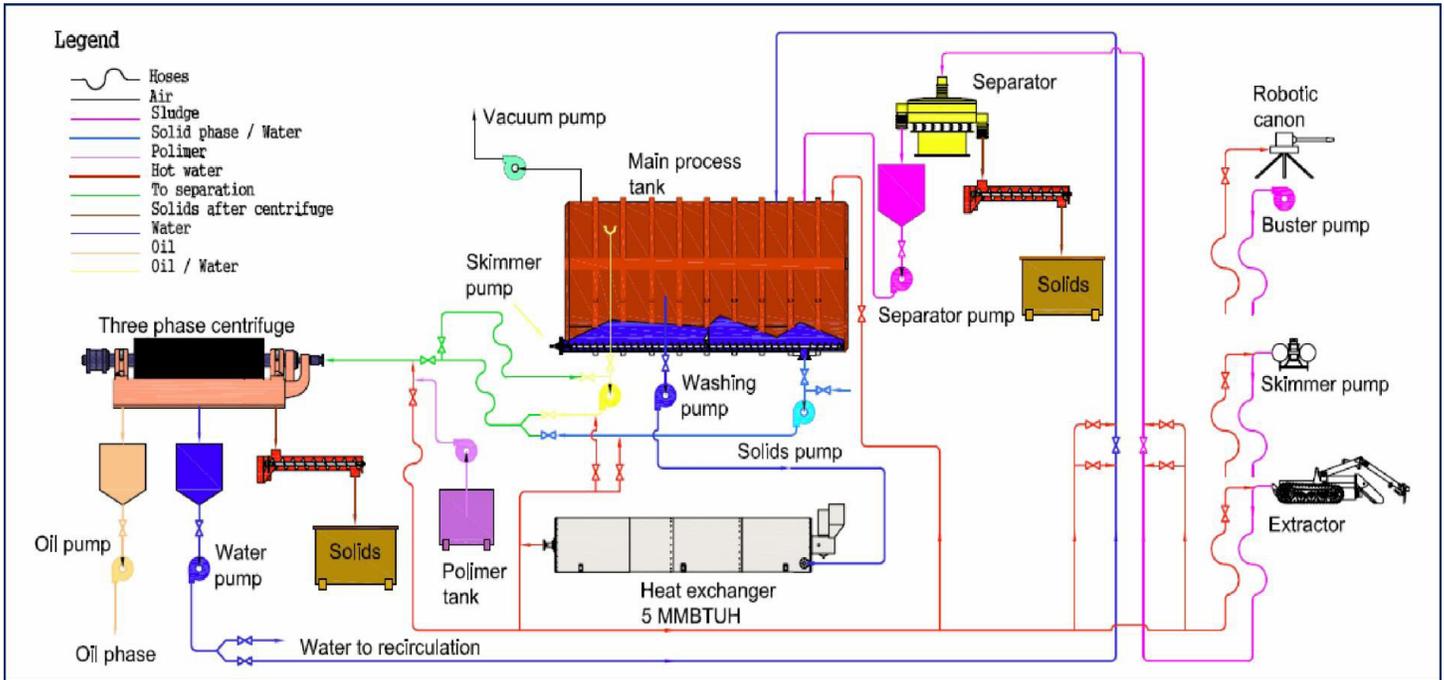
Nunc tristique lectus viverra nunc tristique pretium.

Nunc dignissim metus nec nisl pulvinar semper.

Duis vehicula consequat libero, id adipiscing est pellentesque ac. Proin vulputate fermentum augue vitae posuere. Proin vehicula semper gravida. Sed vitae neque sapien.

# MOBILE ENERGY INDEPENDENT SYSTEM MEGAMACS

## PROCESS FLOW DIAGRAMM



All required hydraulic and process hoses are connected. As soon as water is preheated washing pump switched to cleaning mode to deliver hot water to the Robotic Cannon. After pressurized hot water stream from the cannon dilutes sludge it is extracted from the tank by the booster pump.

Diluted sludge from the booster pump goes directly to the vibro-separator, where large solid particles (6 mm and higher) are removed. Remaining mix enters MegaMacs' main process tank where due to gravitational separation some solid particles settle to the V shaped bottom of the tank and light oil fractions with some captured solids particulate rise on the top of the tank.

Solids from the bottom of the tank are moved by helical conveyor to the suction of screw Mud pump.

Floating skimmer with pump evacuates light oil fraction for further processing on centrifuge unit along with outcome from the Mud pump. Relatively clean water, taken from the middle of the tank pushed through heat exchanger by the washing pump and returns to the robotic cannon, closing the loop. To compensate water loss, some quantity of water has to be added periodically.

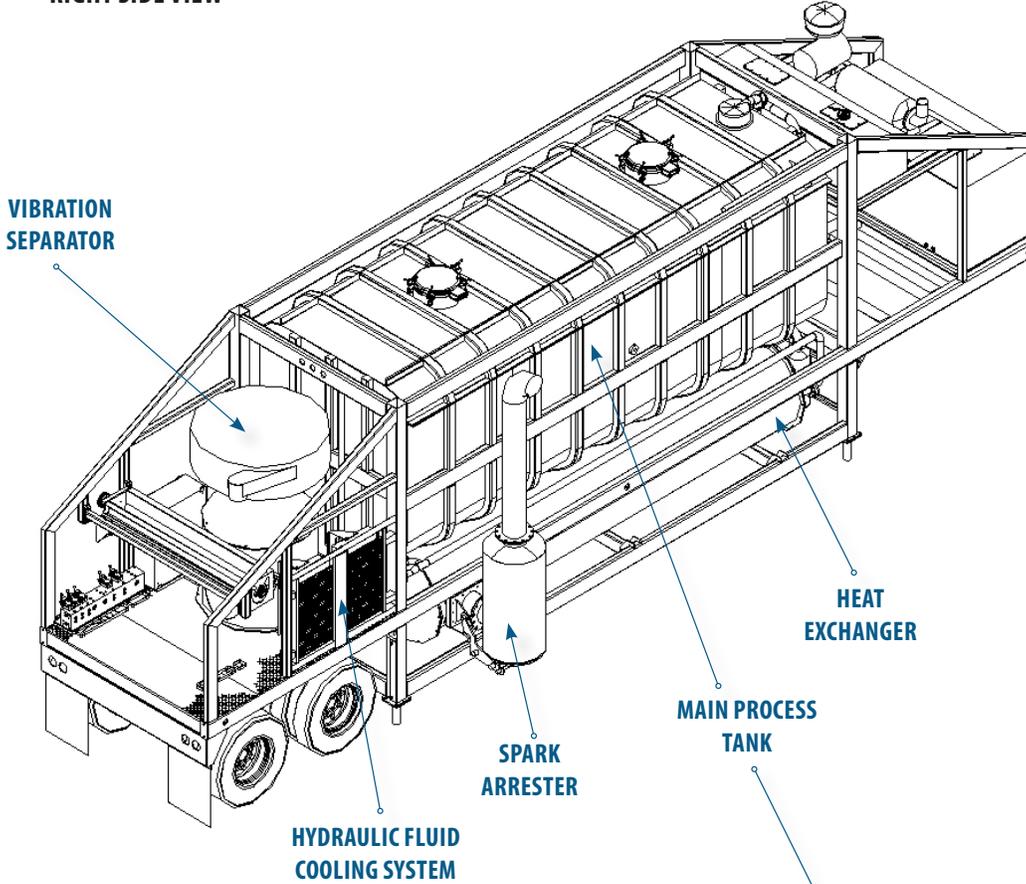
Tree phase centrifuge allows improving system outcome. Reclaimed water after centrifuge is returned back to the main tank for further use, cleaned oil phase is pumped into the customer's product vessel and separated solids are transported by screw conveyor and collected into customer's bins. Typically solid phase content in crude oil sludge is 5 to 10% by weight therefore use of MegaMACS system will reduce volume of disposable material.

Cleaning process continues until bottom sludge is completely removed from the tank. At that stage operators replace canon with washing heads. The heads are installed on tripods and evenly spread across tank bottom. After washing heads are installed and connected, process is resumed and hot water under high pressure is delivered to them by washing pump. Should change of holding product or welding repairs are planed a caustic may be added to the water.

On a final stage after washing heads are removed, high pressure hand guns connected to the system can be used for detail finish cleaning in hard to reach places. As soon as cleaning finished, reservoir is allowed dry out. Entire crew to operate such system is just 4-5 people per working shift.

# MEGAMACS SYSTEM (CENTRIFUGE UNIT) - GENERAL ARRANGEMENT

**RIGHT SIDE VIEW**



## MEGAMACS SPECIFICATION \*

**TRANSPORT:** Highway-legal on most commercial transport roads world-wide.

**TRAILER MOUNTED:** Includes main process tank, diesel engine, hydraulic system, heat exchanger, vibro-separator, fuel and hydraulic tanks, pumps, control system e t.c.

**TRAILER LENGTH:** 480" (12.2 m)

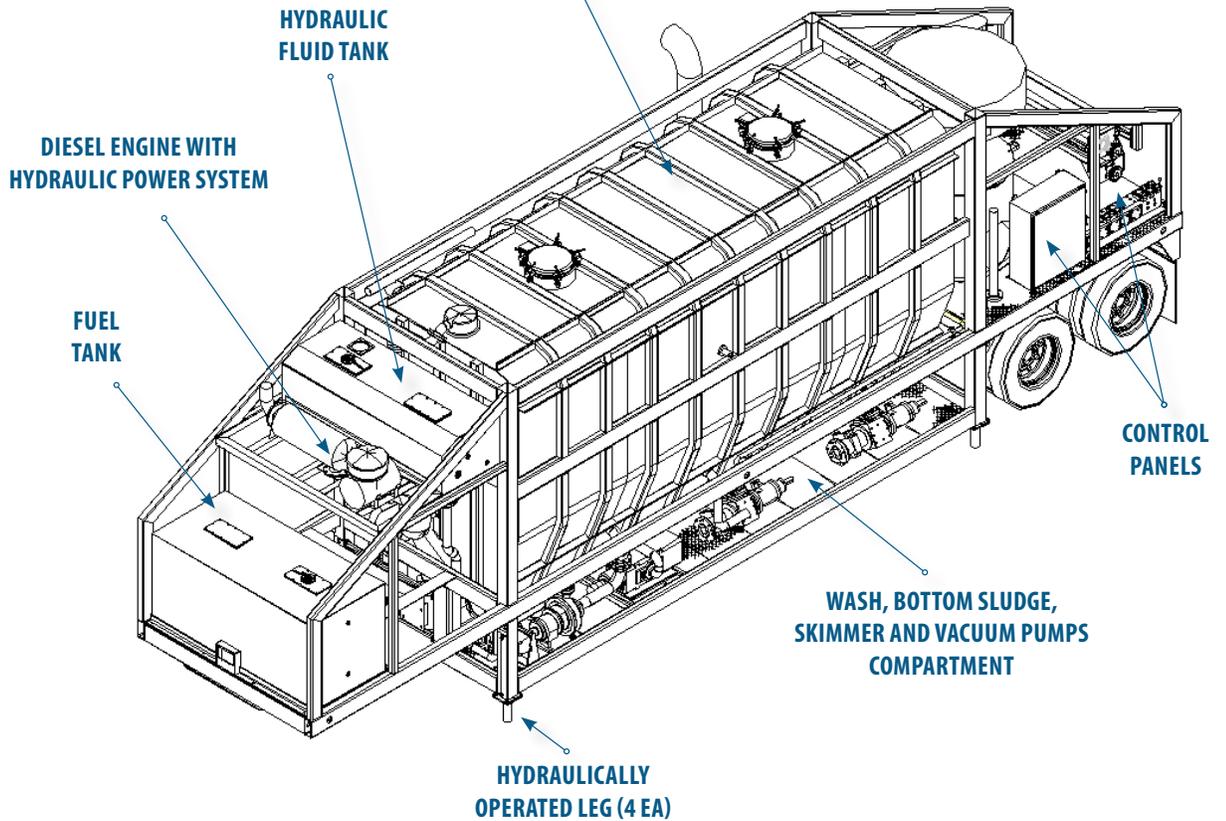
**EQUIPMENT HEIGHT:** 156" (3.96 m)

**TRAILER WIDTH:** 96" (2.44 m)

**TOTAL WEIGHT:** 58,000 lb (26.31 Mt)

**\*NOTE:** Due to on-going product upgrades, specifications and designs are subject to change without notice

**LEFT SIDE VIEW**



# MEGAMACS SYSTEM MAIN PROCESS UNIT SPECIFICATION



## MEGAMACS MAIN UNIT SPECIFICATION:

Suspension:	Single point trunnion #44,000 lb (19,96 Mt) capacity.
Brakes:	Scam, air operated spring brakes.
Wheels and tires:	11R-225 Tires mounted on aluminum wheels.
Engine	Caterpillar C-13, 455 BHP @ 2200 RPM.
Fuel Tank:	600 Gallon (2.27 m3) nominal capacity, 24" Sight glass
Main Processing Tank:	11,000-gallon (29 m3) nominal capacity, designed for full vacuum. Equipped with temperature and level gauges, floating skimmer assembly and live bottom screw. Fully insulated with polyurethane foam and covered with a protective vinyl coating.
Screen Separator:	Screen separator equipped with variable speed hydraulic drive and # 4 mesh screen.
Main Wash Pump:	Screen separator equipped with variable speed hydraulic drive and # 4 mesh screen.
Skim Pump:	Progressive cavity pump. 100 GPM (22.7 m3/hour) @ 87PSIG (6 barg) Hydraulic drive system.
Solids Pump:	Progressive cavity pump. 100 GPM (22.7 m3/hour) @ 87PSIG (6 barg) Hydraulic drive system.
Vacuum System:	Sliding vane vacuum pump 700 CFM displacement @ 1500 RPM Hydraulic drive system Equipped with a primary shutoff assembly, secondary moisture trap, inlet strainer, exhaust oil separator and silencer.
Hydraulic system:	System 1 - 66 GPM (15 m3/hr) closed loop systems for powering the main wash pump at up to 4,000 PSI drive pressure. System 2 - 120 GPM (27.3 m3/hr) main open loop system for powering all other components. Each of the systems is equipped with full flow filtration while the main open loop system provides full flow cooling. The 270 Gallons nominal capacity hydraulic reservoir is equipped with temperature and level gauges while the hydraulic filters and minimum tank level are monitored electrically.
Heat exchanger:	Direct fired spiral tube heat exchanger equipped with Maxon 550 SP oven pack burner. 5MMBTUH on diesel fuel Approximately 40 F delta T @ 300 GPM (68.2 m3/hr). Fully modulating temperature control. Flame safe guard control. Replaceable ASME coil.

# MEGAMACS SYSTEM (CENTRIFUGE UNIT) - GENERAL ARRANGEMENT

The Centrifuge unit is self-contained mobile processing system for the secondary phase separation of liquefied oil sludge.

In addition installed engine can provide a power source to drive various peripheral equipments to extract and pre-process sludge.

## CENTRIFUGE UNIT SPECIFICATION \*

**TRANSPORT:** Highway-legal on most commercial transport roads world-wide.

**TRAILER MOUNTED:** Includes D5 Andritz three-phase centrifuge, diesel engine, hydraulic system, fuel and hydraulic tanks, oil and water tanks, pumps, control system e.t.c.

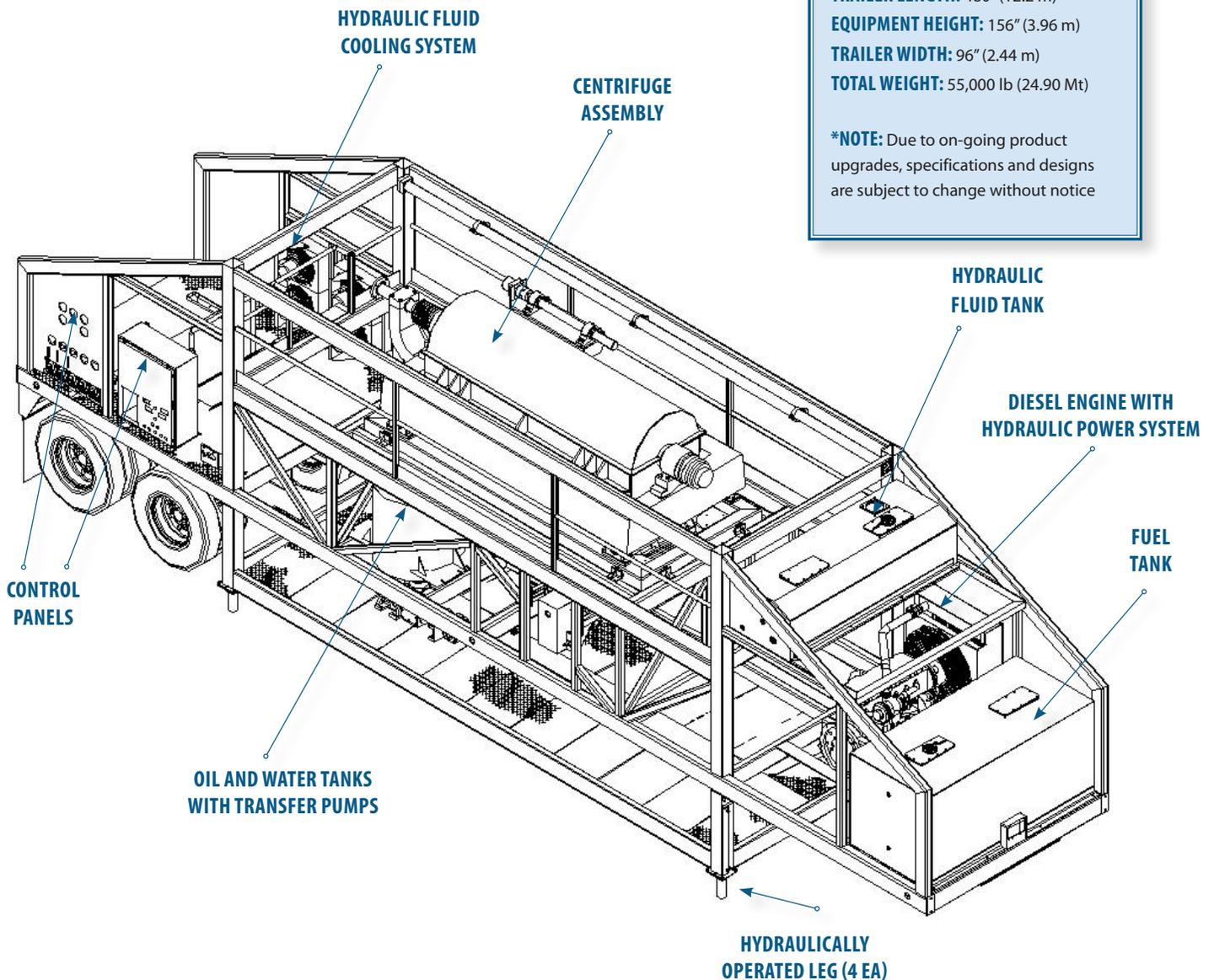
**TRAILER LENGTH:** 480" (12.2 m)

**EQUIPMENT HEIGHT:** 156" (3.96 m)

**TRAILER WIDTH:** 96" (2.44 m)

**TOTAL WEIGHT:** 55,000 lb (24.90 Mt)

**\*NOTE:** Due to on-going product upgrades, specifications and designs are subject to change without notice



Centrifuge unit could be considered as an option depending on specific Customer requirements. Centrifuge provides deep separation of skimmed oil and bottom sediments pumped from Main Process Tank. Centrifuge separates sludge into three phases; oil, water and solid. We use state-of-the-art modern centrifuge model D5 made by Andritz, which is specifically designed to process heavy oil sludge. Horizontal, three-phase machine is built to withstand abrasion and prevent plugging from precipitated heavy hydrocarbons.

# MEGAMACS SYSTEM CENTRIFUGE UNIT SPECIFICATION



Trailer parameters:	Single point trunnion #44,000 lb (19,96 Mt) capacity.
Brakes:	Scam, air operated spring brakes.
Wheels and tires:	11R-225 Tires mounted on aluminum wheels.
Engine:	Caterpillar C-9, 275 BHP @ 2200 RPM.
Fuel Tank:	600 Gallon (2.27 m3) nominal capacity, 24" Sight glass.
Three phase centrifuge:	Hydraulically driven. Maximum speed 2,700 RPM. Acceleration rate 2,300 G.
Centrifuge materials of construction:	Wetted parts - Stainless Steel minimum 316 Frame - Painted Steel Overall Noise dampening cover - Fiber glass
Light phase pump (oil):	Progressive cavity pump. 100 GPM (22.7 m3/hour) @ 87PSIG (6 barg) Hydraulic drive system.
Centrifuge pond depth adjustment:	Heavy phase (Water) - Variable Position pipette Light phase (Oil) - Adjustable setting tubes
Light phase (Oil) - Adjustable setting tubes	For evacuation of solid phase
Helical conveyor:	For evacuation of solid phase
Hydraulic system:	Open pressure compensated system with production capacity 22.7 m3/hour @ 172.4 bar. Centrifuge helical drive hydraulic system is close loop with production capacity 11.8 m3/hour @ 275.9 bar. Centrifuge rotor hydraulic drive is a pressure compensated with open loop with production capacity 5.2 m3/hour @ 255.1 bar. Hydraulic system is equipped with filtration and cooling of hydraulic fluid. Tank for hydraulic fluid is 1022 liters capacity and equipped with thermometer and level gauges. Turn capability off by low fluid level.

# MEGAMACS SYSTEM (AUXILLARY EQUIPMENT)

## ROBOTIC TANK CANNON & SLUDGE EXTRACTOR

### THE ROBOTIC TANK CANNON

is a hydraulically powered and remotely operated machine. This machine uses water or cutter stock as liquefier to turn sludge into the pumpable condition in order to pump it to MegaMACS.

The liquefaction effect is achieved by impact of hot water (cutter stock) under high pressure (20 Bar).

The Robotic Tank Cannon is a remotely operated, high volume jetting system used for cleaning crude oil storage tanks and sludge pits.

It works on a process known as hydraulic mining, in which a concentrated stream of liquid such as water is used to dislodge and move sediments.

Once positioned inside the tank the "cannon's" powerful jet can be remotely operated from control unit stationed outside the tank.

Buster pump placed in front of the Cannon is pumping the liquefied sludge into the MegaMACS Main unit tank for the further processing.



### SLUDGE EXTRACTOR

- is used for extraction of sludge from tank interiors and is hydraulically powered by MegaMacs. The Extractor is designed to be easily disassembled into manageable pieces that can be passed through the standard manhole of a storage tanks exterior for re-assembling inside the tank. Two independently powered track drives are used to propel and maneuver the unit around the tanks interior.

A powerful hydraulically driven digging arm excavates the sludge and draws it into the machine intake from where it moved by hydraulically operated screw to the screw pump suction.

In case of sludge is too hard, it is mixed with hot water or cutter stock prior to be pumped from the tank. Properly operated Extractor can excavate, slurry, and discharge from tank's exterior approximately 18 tons of sludge per hour. Just a single operator is required inside the tank limiting

## SLUDGE PUMPS AND WASH

### POSITIVE DISPLACEMENT SLUDGE PUMP

Positive Displacement Sludge Pump specifically designed for pumping very heavy sludges.

This submersible Positive Displacement Pump can pump substances from water to the heaviest sludge. Pump has production capacity up to 20 m<sup>3</sup>/ hr which is easily controlled by hydraulic system. Pump construction prevents emulsion creation which is very important for future sludge processing. Pump is hydraulically driven and extremely safe. Intake is equipped with special knife which cuts ropes, plastic and other small debris. Should sludge is excessively hard pump is equipped with water/steam intakes to dilute sludge on pump exit. Pump has a reverse spin for fast cleaning. Pump is made out of stainless steel and special aluminum composite for acidic substances. Pump is able to handle debris up to 30 mm.



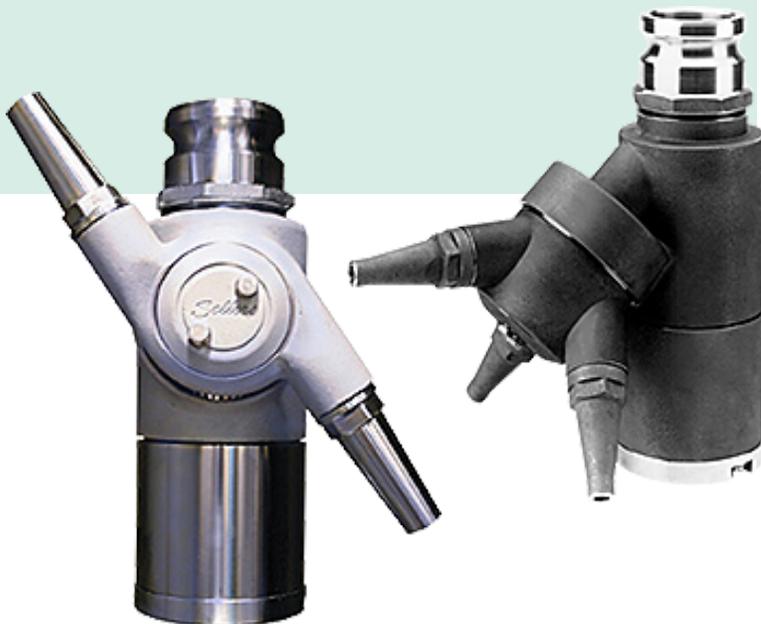
### SUBMERSIBLE BOOSTER PUMP

Submersible Booster Pump is a SS-made, small, lightweight portable pump that is used for transfer of solid laden liquids from storage tanks and sludge lagoons. It is primarily used in conjunction with a liquid jetting device to extract and return liquids and solids to the cleaning system for separation,



### THE 180 - 360 WASHEAD

The "180 - 360 Washead with tripod" is used for tanks washing. This is directional tank cleaning machine utilizes two-three powerful synchronized jets that revolve around the horizontal axis of the machine and index both the bottom and walls of the tank. This indexing provides an extremely tight, half spear ball and twine pattern that impinges evenly and with great force upon the surfaces being cleaned, providing maximum surface coverage even at a great distance. Incremental nozzle advancement per revolution allows a complete cleaning cycle with every sixty revolutions of the machine's T housing. The machine that is driven by the cleaning solution (water) requires little or no monitoring during the cleaning cycle. Heavy-duty tripod makes it a highly efficient cleaning machine with a simple to use mounting system allowing fast and easy setup.



# MEGAMACS SYSTEM (AUXILLARY EQUIPMENT)

## TELESCOPIC SYSTEM

### Hydraulically actuated telescopic apparatus

is specifically designed to provide efficient railcar tanks cleaning Telescopic system with washing heads simplifies and speeds up cleaning process while provides high efficiency and cleaning quality at the car ends by delivering washing heads much closer to the cars ends.

Telescopic system in working position.



Telescopic system installation.

#### FOLDED TELESCOPIC APPARATUS

is lowered to the car man way by on-board equipment or other lifting device. Inside the tank apparatus will be unfolded to the working position with hydraulic actuators.

Apparatus equipped with two orbital washing heads which allow washing both car sides simultaneously.

#### WASHING CYCLE

of car internals can be started as soon as a telescopic apparatus is unfolded, while it will slowly extends to a maximal length, which also reduces required washing time. After washing cycle ends telescopic apparatus retracts and folds in reverse order and then lifted from the car.

### Telescopic System

It is not necessary to move railroad cars to cleaning facility. Facility can come to the site to do the job.

Positions of telescopic apparatus.



MegaMACS employs up-to-date control technologies for trouble-free, efficient operation of the equipment.

Both MegaMACS units are equipped with independent hydraulic power stations and have control systems with control panels to operate diesel engines and hydraulic stations.

### MAIN PROCESS UNIT CONTROL PANEL



System has latch doors to protect control panels during transportation, and bad weather during system operation are equipped with head lights for night operations.

Diesel engine control panel equipped with multifunctional LCD monitor to control major engine parameters such as oil pressure, coolant temperature, engine RPM, battery charging voltage.

Separate gauges provided for control of major engine parameters. Burner controls contains signaling alarm lights and separate temperature controller to modulate burner fuel to maintain desired water temperature. Panel provides extensive diagnostic for easy burner trouble shooting. Hydraulic controls strategically placed and well marked to provide intuitive control and monitoring capabilities of all hydraulically powered devices.

### CENTRIFUGE UNIT CONTROL PANEL



Unit has latch doors to protect control panels during transportation, and bad weather during system operation are equipped with head lights for night operations.

Diesel engine control panel equipped with multifunctional LCD monitor to control major engine parameters such as oil pressure, coolant temperature, engine RPM, battery charging voltage. Separate gauges provided for major engine parameters.

Major centrifuge operation is fully automated. All significant parameters such as bearings temperature and vibration levels are monitored. Machine is equipped with alarm signals and system shutdowns. Advanced Viscotherm control units provide additional operation flexibility. Hydraulic controls strategically placed and well marked to provide intuitive control and monitoring capabilities of all hydraulically powered devices.



# MEGAMACS ADVANTAGES

## 1. COMPLETELY ENERGY INDEPENDENT.

No utilities on site such as electricity, steam, compressed air are required. System needs only diesel fuel for operation.

## 2. MOBILE SYSTEM.

Complete system includes just three units versus 7 units from other manufacturers that could be carried by any regular saddle trucks with capacity to move trailer up to 28 Metric Tons. All MegaMACS units are highway legal on most commercial transport roads world-wide. Transportation speed is up to 80 km/hr.

## 3. MEGAMACS MOBILIZATION AND DEMOBILIZATION TIME ON A JOB SITE DOES NOT EXCEED 4-6 HRS.

(versus 7-10 days for other systems on the market). MegaMACS installation does not require any ground preparation. No lifting devices

are required. Both MegaMACS units are self leveling by hydraulically operated legs installed on each unit. Just relatively leveled ground up to 70 m<sup>2</sup> is required. System is installed outside bund wall eliminating following bund wall repairs.

## 4. FLEXIBILITY.

MegaMACS can be used for tanks, rail-road cars, ponds, lagoons, pits and ships and other vessels cleaning with different auxiliary equipment included in scope of supply by customer's request.

## 5. PERFORMANCE

- High cleaning speed (On average 3-4 time is faster than any system on the market).
- High cleaning quality (Welding jobs can be started after the final washing stage of the cleaning process).

## 6. MEGAMACS REDUCE QUANTITY OF OIL WASTE TO BE

## DISCHARGED ON AVERAGE BY 10 TIMES.

Depending on sludge nature up to 90% of sludge could be recovered into reusable (sellable) oil product reducing amount of waste to be discharged dramatically and bringing additional profit.

## 7. HIGHEST LEVEL OF SAFETY DUE TO:

- a. Just hydraulically driven parts are installed on both MegaMACS units. System does not use any electrically driven motors.
- b. System installation is up to 300 m from the tank cleaned.
- c. Continuous automated grounding monitoring with automatic system shut off in case of faulty ground.
- d. Continuous automated gas monitoring inside the tank with automatic shut off in case of dangerous atmosphere inside the tank detected.

## 8. SHORT PAY OFF TIME.

On average system pay off time do not exceed 18 month. Shall 2 shifts operations is allowed system can be paid of in less than 10 month.

## 9. RUGGED CONSTRUCTION WITH LOW DOWN TIME.

Equipment is designed for easy maintenance with top of the line components. Similar, common off shelf parts are used to simplify parts sourcing and reduce cost.

## 10. ENVIRONMENTALLY CLEAN OPERATIONS.

MegaMACS does not generate any dirty water to be discharged. Caterpillar engines installed on both units have very low level of emission compliant with very strict US (Californian) requirements.

## 11. TOP NOTCH TECHNICAL SUPPORT FOR THE EQUIPMENT LIFE TIME.

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