



EC

Emulsion Cracking Systems

The EC systems are a compact, efficient system designed for breaking and separating oil-in-water emulsions.

Pan America Environmental manufactures emulsion cracking systems for emulsion breaking of a variety of waste types in industrial wastestreams. EC Series emulsion breaking systems are designed to remove free/dispersed and emulsified hydrocarbon products in wastewater streams through the use of chemical cracking technology. The emulsion is cracked via pH adjustment and/or emulsion cracking chemistry. Oil water separation follows the cracking stage.

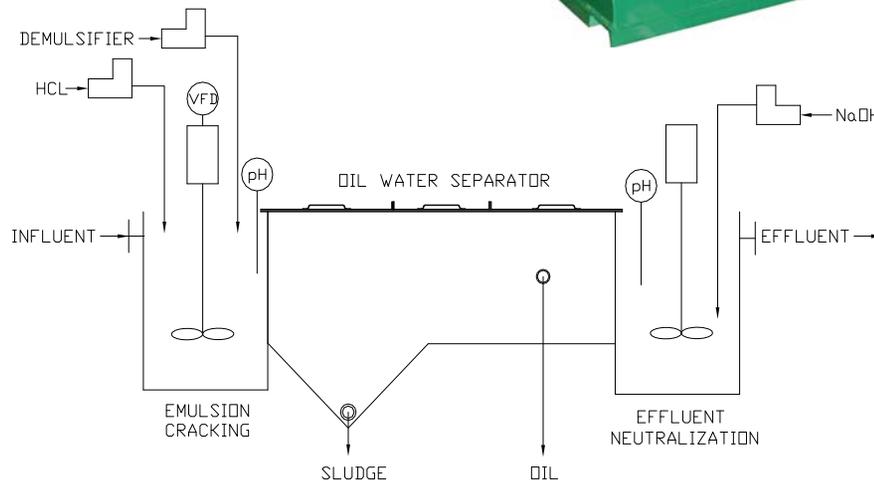
Many sizes, chemical processes and custom designs are offered up to 200 GPM. The compact EC Series emulsion cracking systems are designed for above grade applications with many features and options to provide engineers, system integrators and end users with convenience and flexibility in system integration choices. Customization & modifications are available.

Customization & modifications to fit your project needs are offered. Typical performance is 10 ppm or less, 30 micron oil droplet.

Products removed: motor oils, fuels (vehicle/jet), fuel oils, hydraulic fluids, immiscible machining oils, lube oil, transmission fluid, bunker c, DNAPLs, LNAPLs, vegetable based oils, crude, air compressor lube & other hydrocarbon based derivatives (BTEX etc.). Model sizing is based on the oil/fuel specific gravity, droplet size removal desired and other parameters of the wastestream.

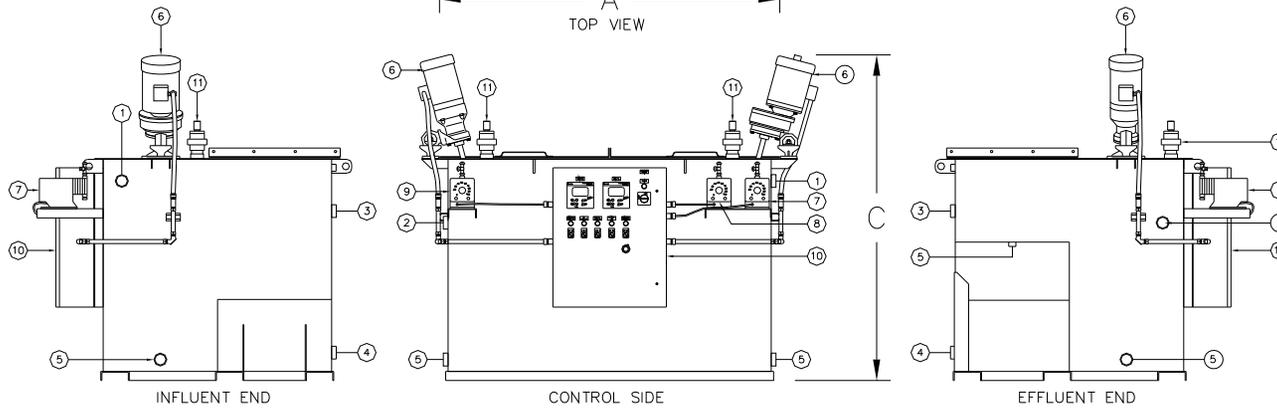
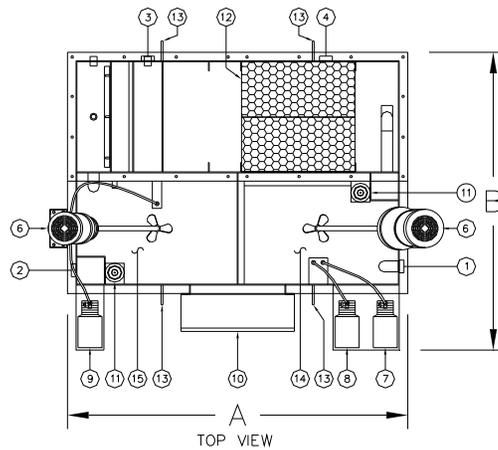
Applications

- Frac water
- Produced water
- Biodiesel plants
- Petrochemical plants
- Groundwater remediation
- Aircraft maintenance
- Ballast water
- Bilge water
- Latex removal
- Tank & truck wash
- Manufacturing plant



EC

Emulsion Cracking Systems



Item List

- 1 Inlet, wastewater
- 2 Outlet, treated water
- 3 Outlet, oil
- 4 Outlet, sludge
- 5 Drain
- 6 Mixer
- 7 Pump, chemical, demulsifier
- 8 Pump, chemical, acid
- 9 Pump, chemical, NaOH
- 10 Control panel
- 11 pH Probe
- 12 Flopak coalescing media
- 13 Lifting lugs
- 14 Reaction chamber, emulsion break
- 15 Reaction chamber, pH adjustment

| Model | Dimensions | | | Weights (lbs) | | Flow GPM |
|-------|------------|--------|-------|---------------|-----------|----------|
| | A | B | C | Empty | Operating | |
| EC-4 | 5'-11" | 3'-10" | 4'-4" | 1700 | 3965 | 8 |
| EC-8 | 5'-11" | 4'-6" | 4'-4" | 2425 | 7900 | 16 |
| EC-12 | 6'-7" | 4'-6" | 6'-4" | 2910 | 9050 | 25 |
| EC-16 | 6'-7" | 5'-6" | 8'-4" | 3454 | 11600 | 35 |
| EC-24 | 7'-10" | 6'-10" | 8'-4" | 4800 | 13000 | 50 |
| EC-36 | 8'-4" | 7'-10" | 8'-4" | 6250 | 15000 | 70 |
| EC-48 | 11'-4" | 8'-6" | 9'-4" | 8300 | 16500 | 100 |
| EC-64 | 12'-6" | 8'-6" | 8'-6" | 9750 | 20000 | 125 |
| EC-80 | 13'-6" | 9'-6" | 8'-6" | 10900 | 25000 | 150 |

Dimensions, weights and design subject to change, not for construction.

Pan America Environmental, Inc. 950 N. Rand Rd., Ste 120 Wauconda, IL 60084 USA 847.487.9166 panam@panamenv.com www.panamenv.com

©1991-2013 Pan America Environmental, Inc.



Process Described

The EC Emulsion Cracking Systems are designs that provide a combination of physical chemical treatment and separation via oil/water separation.

The basic EC system configuration consists of:

1st stage: emulsion breaking
2nd stage: product separation
3rd stage: pH adjustment for discharge (typically 6-9)

Stage 1: provides for the addition of acid for a less rigorous, simple acid cracking method or singular/multiple polymers for more complex, stubborn emulsion cracking.

Stage 2: provides for separation of the freed product via a coalescing oil/water separator or Dissolved Air Flotation (DAF) system. In applications where the result sinks a Slant Plate Clarifier may be used in place of the other two.

Stage 3: provides pH adjustment to return the water pH to the 6-9 range for discharge. Due to pH manipulation being required in most emulsion cracking applications, this step is typically required.

Determining Chemical Process: Each emulsion must be tested in order to determine the chemistry, but also to determine system design. Analytical testing should be performed after the bench testing to verify process efficiency. We recommend the use of a chemical supply company that can perform on site jar testing and provide the proper chemicals for the daily operation.

Emulsions Defined

Emulsions are defined as a colloidal suspension of a liquid within another liquid (with droplet sizes typically under 20 micron). A colloidal suspension is a concentration of particles or droplets homogeneously dispersed through the carrier liquid (water). This means the oil droplets are reduced in size to such a degree that the oil's normal electrical repulsion of the water molecule is overcome due to its minute size. Oil in water emulsions may contain a variety of oil types

and concentrations, as well as various types of solids contaminants. The oil in water emulsion in a stable or unstable state maintains the emulsification through mechanical and/or chemical means.

Emulsions Are Created In Two Ways

Mechanical emulsion: In mechanical emulsions a common method of creating the emulsion is by violent mixing or shearing of the oil droplet in the wastestream with a high shear transfer pump, vigorous mixer or other device that might disperse the oil droplets into minute droplets. Given enough time, the mechanical emulsion may break without any treatment. But with most processes and manufacturing time frames this time may be too long for practical use.

Chemical emulsion: Are created when a surface-active chemical or chemicals are used, such as alkaline cleaners containing surfactants, soaps and detergents having ionic or nonionic characteristics. These chemicals interfere with the natural coalescing of oil droplets and generally creates a permanently stabilized emulsion with little chance of breaking by itself.

Coagulants

Emulsion cracking can be facilitated by the use of a coagulant/flocculent or pH changing chemical (acid/caustic). The chemical used depends on the particular emulsion. These chemicals change droplet electrical charges by the effect of their own charge, usually a cationic (positive) charge. This charge manipulation allows the oil droplets to become free and lets them coalesce (gather together) into larger droplets. The oils don't always break out of emulsion into a free distinct layer. Sometimes they may be combined with solids or create a light mass that is in suspension, sinks or (usually) floats. The form and appearance of chemical emulsion cracking results can vary quite a bit from emulsion to emulsion. This variation helps to determine the type of equipment and processes required to treat the water.

EC

Emulsion Cracking Systems

The destruction of the emulsifying properties of the surface-active agent or neutralization of the charged droplet can be effected with the use of polymer products. A polymer or combination of polymers destabilize the electrical bond between oil and water allowing oils to free themselves, creating droplets and a distinct layer or flocculated mass. Flocculation refers to the successful collisions that occur when the destabilized particles (oil) are agglomerated via a bridging effect due to the flocculating polymer. The polymer acts like a broom, effectively stretching out in the water and bringing many small microfloc particles together into a larger visible mass. Depending on the nature of the flocculated mass in may sink, float or stay in suspension. Numerous bench tests should be performed to determine the proper chemical types, concentrations and combinations in order to achieve optimum treatment.

