



## HYDROCARBON RECOVERY TECHNOLOGY

HRT® provides petroleum producers, refiners and gas processors dramatically improved **solids control and hydrocarbon recovery** from process water streams.

Applications for HRT® include:

- Produced Water Management
- Oil Removal from Waste Water
- SRU Optimization

HRT® affords proven performance while eliminating the need for expensive excess processing, chemical additives, and storage tank capacity. With hydrocarbon recovery efficiencies of 99.98%, HRT® produces a **sellable product**, balancing or even outweighing operating costs and capital investment.

Clients using HRT® on process water systems have experienced operational, environmental and economic benefits, including:

- Operational flexibility
- Reduction of lost energy
- Savings on chemical additives
- Lower maintenance costs associated with fouling
- Elimination of excursions

### Why is HRT® better than conventional solutions?

Most process water systems experience either periodic or continuous hydrocarbon and/or solids upsets, leading to:

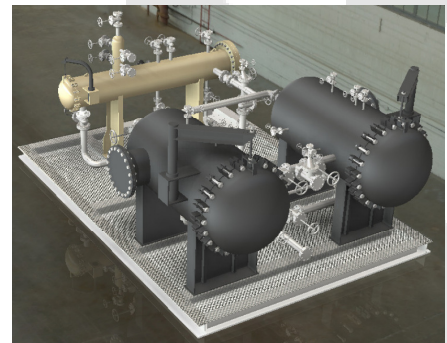
- diminished capacity
- loss of valuable product
- fouling of heat transfer surfaces and equipment
- and in extreme cases, shut down due to environmental emissions.

Residence tanks are ineffective at separating emulsified hydrocarbon from aqueous streams, allowing essentially all dispersed hydrocarbon to pass through.

Likewise, walnut shell filters, or induced gas/dissolved air flotation (IGF or DAF) are limited to applications with less than 200-300 ppm oil and under the best of circumstances are typically 90% - 95% effective.

HRT® was developed to remove solids as fine as ½ micron to 99.98% efficiency with hydrocarbon concentrations greater than 5%, and with hydrocarbon specific gravities as high as 0.98, allowing effective separation of hydrocarbons as heavy as polynuclear aromatic oils. It will intercept and recover even stable emulsified hydrocarbons, allowing essentially zero free hydrocarbons to pass through. Consequently, HRT® provides vast improvements in the treated water quality.

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*Hydrocarbons in the circulating amine are typically present on a continuous basis at up to 1,000 ppm and during upsets to levels of 50,000 ppm. As little as 100 ppm hydrocarbon making its way through a flash tank represents 26,280 gallons of hydrocarbon per year which may accumulate in the regenerator resulting in foaming; co-mingle with corrosion products to foul exchangers and reboilers, decreasing energy efficiency; or compete with H2S for oxygen in the sulfur plant diminishing sulfur capacity and conversion efficiency.*



HRT's robust design is **scalable and modular** for both new capital projects as well as placement in existing operating units. Each system is designed to address the specific operational constraints of the application.

HRT® assists in maintaining a **balanced system** which provides:

- higher process reliability
- energy efficiency
- reduced potential for emissions
- reduced product loss
- significantly reduced system maintenance



#### ABOUT PENTAIR SEPARATION SYSTEMS

Pentair Separation Systems designs and manufactures advanced technologies for the high performance separation of solids, liquids and gases. These technologies are used to help facilitate balanced systems that are highly stable, reliable and robust, thereby increasing throughput, reducing operating cost and minimizing waste.

The company's technologies help solve the most critical separation and extraction issues for the gas, refining, chemical and power generation industries.



#### CASE STUDY HIGHLIGHTS: MIDDLE EAST

- **Almost complete removal of hydrocarbon and TSS (~ 5 ppm at outlet; TSS reduced to 1.4 mg/L).**
- **Significant Improvement in water quality relative to combined IGF / Walnut Shell Filter / Clarifier System**
- **Separated oil recovered as sellable product (180 ppm = \$400,000 USD/yr)**
- **Minimal operational intervention required**
- **Increased reliability; more flexible operation; wider operating window**

*Hydrocarbons in produced water are typically present on a continuous basis at up to 1,000 ppm and during upsets to levels of 50,000 ppm. As little as 100 ppm hydrocarbon making its way through a conventional system represents 26,280 gallons of hydrocarbon per year which may accumulate in downstream equipment, cause dangerous and costly emissions, or limit the effectiveness of Enhance Oil Recovery operations. This also represents more than \$50,000 of potential revenue lost.*