BioPetroClean

BPC's ACT Biological Solutions for Refinery Wastewater

Fully Integrated Solutions for Modern Wastewater Challenges

Automated Chemostat Treatment (ACT): Optimizing System Efficiency

BioPetroClean's Automated Chemostat Treatment (ACT) is an innovative solution to eliminate major bottlenecks in industrial wastewater treatment. ACT process is specifically designed to reduce sludge in refinery wastewater operations. It can be integrated to compliment side stream systems as well as main water streams, where it can anticipate and prevent upsets.

Complete automation and stability are the primary components of the reliability of the ACT system. Each installation is monitored by online sensors enabling real-time reaction. ACT immediately detects errors in the system, automatically resolving the problem without intervention. The control systems will simultaneously receive a report of the error, and notify the relevant personnel via SMS and email.

ACT functions as an add-on to refinery wastewater systems:

- Reduces the sludge created in the process by 65%
- Enables cost-effective capacity increases
- Creates the ability to isolate heavy-load streams and increase overall productivity
- Provides an efficient way to degrade Oil, Phenols and other organics contaminations

The Technology behind ACT

ACT utilizes BPC's exclusive bioremediation technology to reduce hydrocarbons, TOC, COD, and suspended solids from greasy and oily waters, leaving effluents well below industry regulation levels. Based on a water sample from the refinery, BPC determines the most effective solution for treating the specific refienry issues.

Once applied to the wastewater treatment process, the stabilized chemostat principle eliminates the need for complicated and costly sludge recycling. The hydraulic age and the bacterial age become equal, requiring a lower density of single cell bacteria. This results in the highest concentration of active, non-aggregated microorganisms, creating a more efficient process overall.

ACT System Key Features

- Customized for optimal cost-effective performance
- Increased capacity to prevent shortfalls during peak time processing
- Fully-automated process
- Process stability maintained, even during inlet fluctuation

Water Quality Specifications with ACT Technology

WASTEWATER PARAMETERS	UNIT	% REDUCTION	TREATMENT RANGE
TPH	ppm	99	5-300
COD	ppm	90	400-4000
TOC	ppm	90	100-1000
TSS	ppm	90	50-200
Phenol	ppm	99	2-35
T-Nitrogen	ppm	90	50-200
BTEX	ppm	99	10-200

ACT for Main Stream Purification

ACT technology can be seamlessly integrated into the main stream purification system of any refinery. Fully automated and designed to be flexible, the platform requires no additional space for expansion or added manpower.

ACT Benefits for Refineries:

- Eliminates the need to reactivate bio-sludge
- Creates a more streamlined and efficient process by eliminating many complex operations
- Reduces costs by as much as 50%
- Reduces sludge generation and handling significantly as well as corresponding chemical usage

Main Stream Wastewater Specifications

WASTEWATER PARAMETER	VALUE OR DESCRIPTION
Source	Oily effluent streams (from various parts of refinery)
Flow	100-1000 m3/hr (500-5,000 GPM)
pH	6-9 (can be adapted to raised or lower pH) with pH adjustment module
Salinity	Up to 4 % salt
Temperature	Ambient seasonal temperature (13- 450 ºC)
Discharge Location	Nature or Reuse
Organic Load	Up to 1 kg/hr
Waste Residence Time	30 hours

ACT for Extra Capacity Treatment

Heavy Loads/Low Volume

ACT can increase overall capacity and stability by providing separate treatment to side streams containing high organic loads. ACT constantly re-balances the organic concentration to match the main stream, subsequently releasing any organic bottlenecks.

High Volume/Low Loads

High volume streams with low organic load (such as storm water) are treated separately by ACT in their original holding tanks, and discharged directly to nature. This relieves the main wastewater treatment system contributing to an increase in overall capacity and stability.

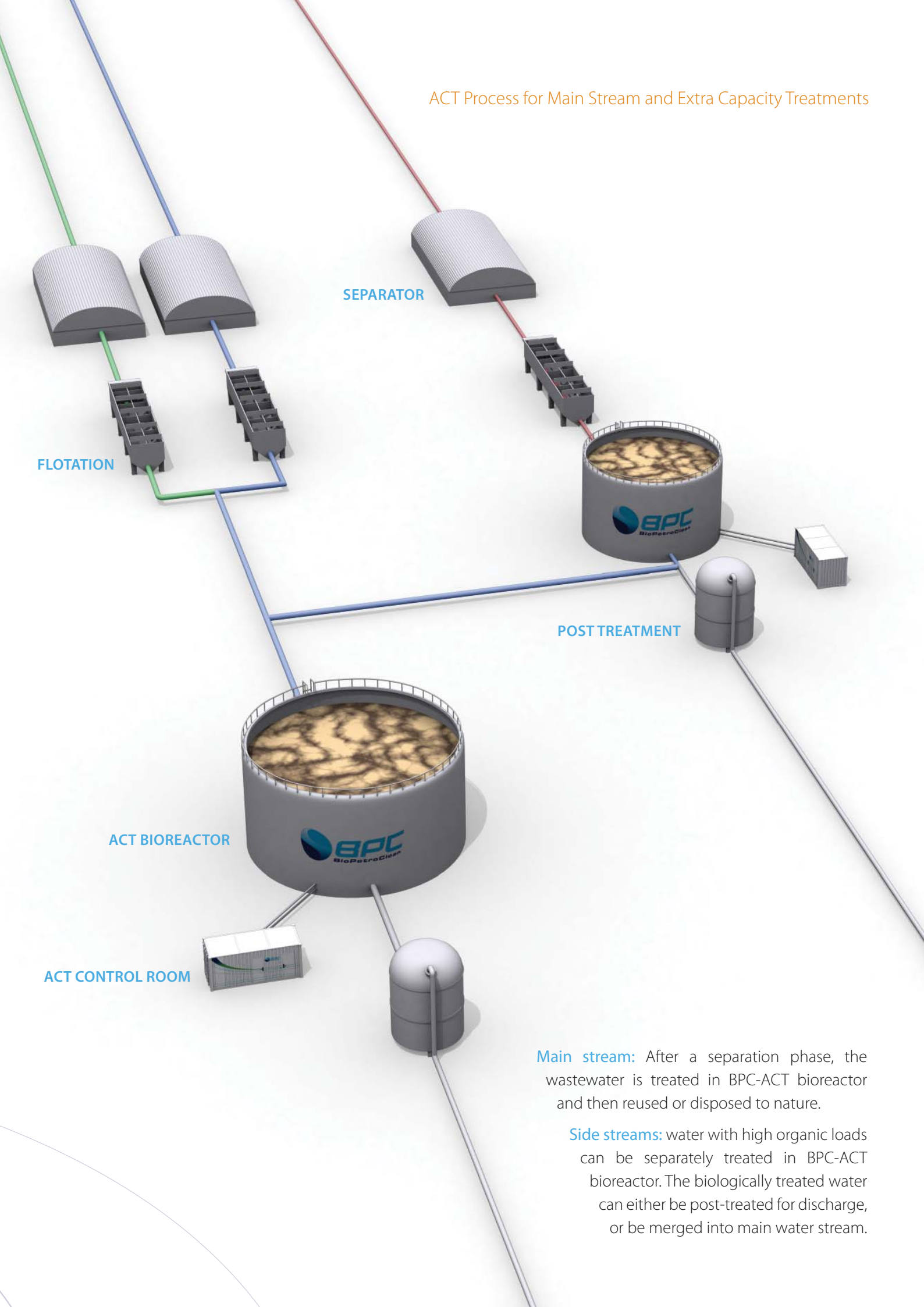
Extra Capacity Feature Summary:

- Treats highly contaminated refinery effluents
- Relieves the main wastewater treatment system from treating high volume loads
- Increases system stability and overall side stream capacity
- Enables reuse of refinery fresh water
- Reduces upset occurrences and refinery malfunctions

Extra Capacity Wastewater Specifications

WASTEWATER PARAMETER	VALUE OR DESCRIPTION
Origin	De-salter effluents, stripped sour water, contaminated rain water
Flow	50-1000 m3/hr (250-5,000 GPM)
Salinity	Up to 4 % salt
Temperature	Ambient seasonal temperature (13- 45 ºC)
Discharge Location	Back to main stream/Reuse/ Nature
Organic Load	1-3 kg/hr
Waste Residence Time	10-60 hours

ACT Process for Main Stream and Extra Capacity Treatments



Main stream: After a separation phase, the wastewater is treated in BPC-ACT bioreactor and then reused or disposed to nature.

Side streams: water with high organic loads can be separately treated in BPC-ACT bioreactor. The biologically treated water can either be post-treated for discharge, or be merged into main water stream.

ACT for Upset Recovery Systems

BPC's ACT upset recovery system automatically detects and resolves problems through its online monitoring system. Upon detection of a problem, ACT directs the upset waters to a separate tank for bioremediation treatment. This reduces the load in the main wastewater treatment system, subsequently preventing upset occurrences and providing refinery personnel with uninterrupted operation.

Upset Recovery Feature Summary:

- Fluent operation with fewer operational disruptions
- Minimized capacity shortfalls during peak time processing
- Fully-automated reaction, even if operators are not on-site

Upset Recovery System Specifications

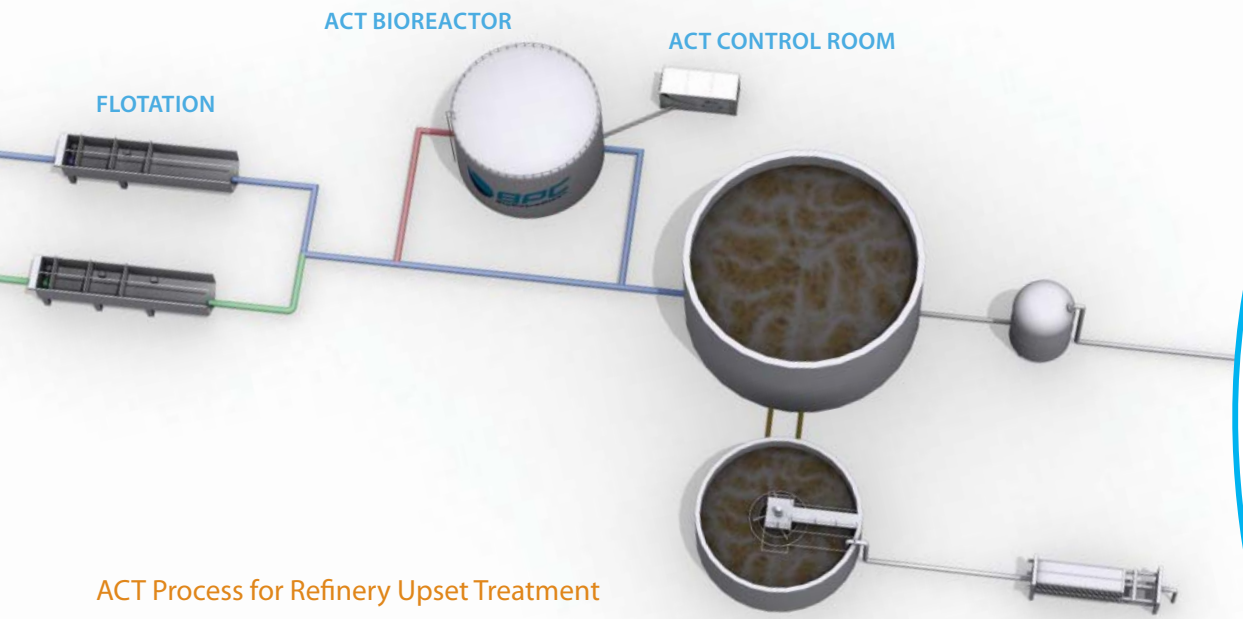
WASTEWATER PARAMETER	VALUE OR DESCRIPTION
Origin	Variety of system malfunctions
Salinity	Up to 4 % salt
Discharge Location	Back to main stream
Organic Load	Up to 5 kg/hr
Waste Residence Time	Batch systems of 1 week retention time

Operating with ACT

BPC's HMI PC system provides refineries with enhanced, automated operational capabilities. This allows for increased visibility, full process control, and real-time management. The highly advanced control system continuously monitors various water parameters such as (organic load, DO, TOC, nutrients, pH, temperature etc.), and automatically overcomes system fluctuations. On-line alerts (SMS) sent to the operators' mobile phone, enable prompt and efficient response.

ACT Control Feature Summary:

- Full automation reduces manual adjustments needed by system operators
- Custom configuration of alerts and system halts provide better process control
- Internet connection allows for remote servicing by operating personnel or BPC
- Automated flow control
- Organic load control



ACT Process for Refinery Upset Treatment

BPC's On-Site Pilot Program

BioPetroClean offers an on-site pilot test in order to accurately assess a prospective customer's needs in terms of water quality and operational cost savings. Each pilot consists of a 20-foot container, pre-equipped with a complete control system, and a biological reactor. The operation of this container and the water treatment process are completely seamless and do not interfere with existing operations, requiring only an inlet and outlet water line, and a three-phase electrical connection.

Please contact us for more information on the pilot program or any BPC solution.

ACT Control Screen

ACT Mobile System

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