

Pioneer in
spent caustic
modern
treatment
systems
development

ISCT

**Integrated Spent
Caustic Treatment**

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Start-up in environment
protection





What is ISCT?

ISCT (Integrated Spent Caustic Treatment) is a thorough complex of chain processes of spent caustic treatment. The chain begins with red or disulfide oil extraction using pyrolysis gasoline or wash oil which extracts a vast range of hydrocarbons from spent caustic. The next step is neutralization of alkalinity using carbon dioxide or liquid acid. So ISCT continues with dissolved air/gas floatation (DGF/DAF) to remove suspended solid. Final step in ISCT is advanced oxidation (AOP) to remove COD.

“The first Iranian thorough solution for Spent Caustic”

Applications and Mechanism

In general, the application of such processes in wastewater treatment is a novel phenomenon.

Spent Caustic is one of the worst waste streams in oil, gas and petrochemical industries. It caused serious problems including:

- ❖ Red oil accumulation and polymerization (Olefin Spent Caustic).
- ❖ Exothermic reaction and air pollutant gas release in neutralization of alkalinity.
- ❖ Contamination of Disulfide Oil.
- ❖ High level of COD, TDS and Sulfur compounds.
- ❖ Toxicity.

Red oil is a complex of polymers growing in molecule size. Its origin is oxygenates of ethane thermal cracking in olefin plants. Polymer chains grow to produce sticky

clogging material specially during neutralization with H_2SO_4 . Online extraction of red oil from caustic in live CO_2 absorption and from purged spent caustic is included in ISCT (depending on client's order). Neutralization with CO_2 is a case of carbon capture and storage that prevents exothermic reactions leading to facility damage. Also neuter pH in the range of 7 to 8.5 could be guaranteed.

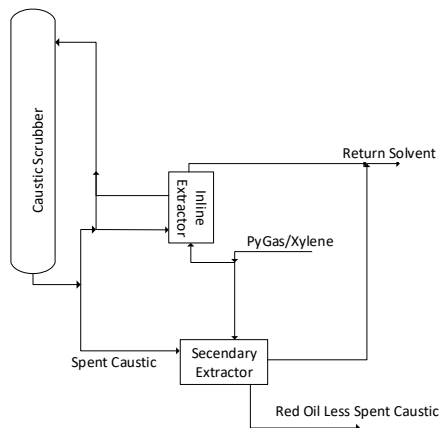
DAF and DGF are conventional methods of suspended solid and free oil removal. AOP is a combination of Ozone/ H_2O_2 /UV radiation to eliminate the rest of contaminants could be replaced with low or medium pressure wet air oxidation.

Extraction is optimized to reduce gasoline consumption in plants without PyGas product. In this case, PyGas recovery package will be included.

TDS is reduced to a quarter of initial value during CO_2 neutralization.

Extractor:

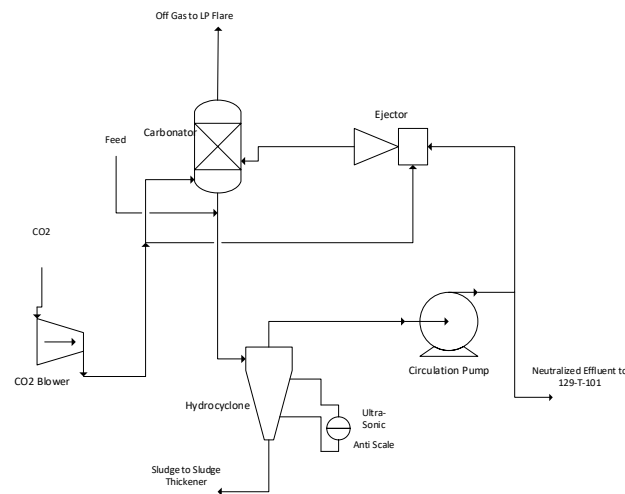
- ❖ Online accessory of live caustic in cycle.
 - ❖ Acts as polishing of caustic Red oil / DSO.
 - ❖ Prevents red oil polymerization in absorption tower.
 - ❖ Prevents DSO return to LPG from oxidizer to mercaptan extractor.
- ❖ Extraction of Red oil / DSO from spent caustic.
 - ❖ Prevents storage, neutralization and treatment facility clogging.
 - ❖ Elimination of foaming in acidification and ozonation system is achieved.
 - ❖ Reduces COD and oil that leads to lower required oxidation capacity and better final specs.



Carbonator:

- ❖ An alternative of neutralization with liquid acid.

$$CO_2 + 2NaOH \rightarrow Na_2CO_3 + H_2O$$
 - ❖ Smooth pH reduction without aggressive heat generation.
 - ❖ Final pH of 7 to 8.5 without deep acidic condition.
 - ❖ Reduction of dissolved solids.
 - ❖ Efficient reduction of COD.
 - ❖ Stripping H_2S and RSH and sweeping to flare of safe location that removes wastewater odor.
- ❖ Carbon capture and storage.
- ❖ Elimination of acid cost.
- ❖ Production of solid Sodium Bicarbonate.



Oxidizer:

- ❖ Combination of Advanced Oxidation Process (AOP) or Tubular Wet Air Oxidation (TWAQ).
- ❖ Final treatment of COD using $O_3/H_2O_2/UV$ in AOP and low pressure direct oxidation in TWAQ.
- ❖ Final effluent:

COD	<1000 ppm
TDS	<2.5 g/l
TSS	<10 ppm
SO ₄	<10 ppm
Sulfide	Nil
Oil	<10 ppm
Odor	Nil
Appearance	Clear, Colorless

Similar Processes in Worldwide Scheme:

MERICON III:

- Developed by MERICHEM Company.
- Includes Ozone, UV and H₂O₂.
- Developed in 21st century.
- Installed in several refineries in Texas, US for jet kerosene spent caustic (NAPFINING and THIOLEX demercaptanization processes) with COD of 170,000 ppm.
- MERICHEM Company is active in spent caustic solutions for 75 years.
- The former solutions of this company was MERICAT I and MERICAT II, were based on wet air oxidation and catalytic air oxidation.
- Further information is available here: www.merichem.com

AQUATECH

- AQUATECH is an American company active in special wastewater treatment.
- This company offers Advanced Oxidation Process and Wet Air Oxidation for Spent Caustic and Landfill Leachate.
- The feed liquids COD is up to 100,000 ppm.
- Further information is available here: www.aquatech.com

MiPro eco3

- Developed by Xylem industrial group, WEDECO promix company (A sub-division of Xylem).
- It is a combination of Ozone, UV and H₂O₂ and used for highly contaminated wastewater and ultra-purification of potable water.
- Further information is available here: www.xylem.com



