

# JET" SAPONIFICATION

The JET has been developed since decades as a tool to trigger the saponification (or neutralization) processes. For historical reasons, notwithstanding its efficiency, the JET has been utilized only in some areas of the world or by certain multi-national companies.

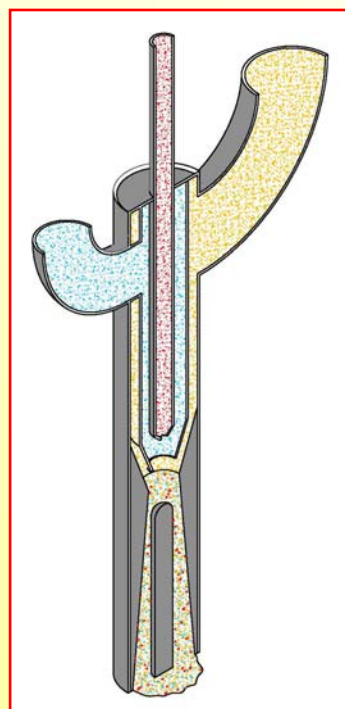
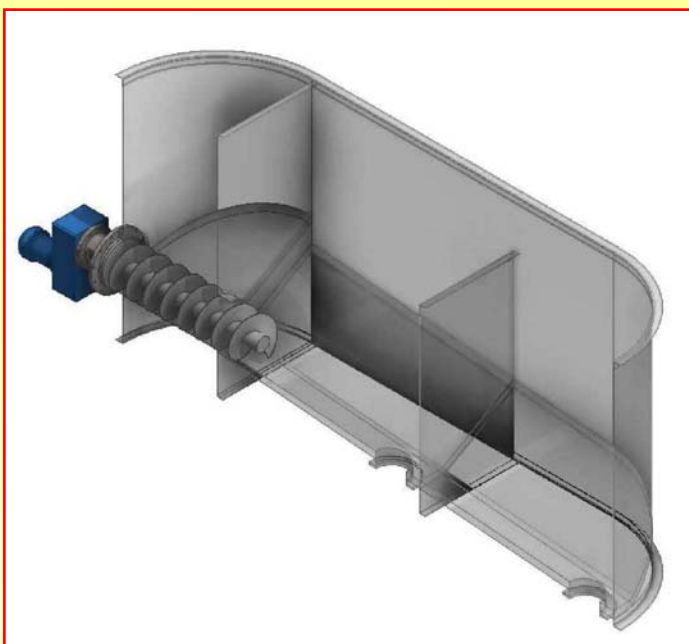
The main feature of the JET is the immediate start of the reaction in a very small volume, internal to the JET. Thanks to the energy passed by a small flow of live steam (kinetic and thermal), the pumped reagents (oil blend and alkali) immediately form a stable homogeneous emulsion which flows out the JET.

The emulsion consists of freshly produced soap, oil, alkali, water etc. In such environment the reagents continue to saponify without any additional supply of energy.

In a conventional saponification process the initial reaction is slow, while with the JET such stage is immediately completed and the saponification easily reaches its linear reaction phase.

The JET is a general-purpose tool that can be used in Semi-Boiled processes in combination of an Atmospheric Continuous Reactor or a Batch Crutcher as well as in Full-Boiled plants on top of Kettles.

In a conventional saponification plant the use of a too concentrated caustic soda solution (i.e. 50% NaOH) brings to a not homogeneous soap mass. Furthermore such soap tends to be highly viscous and cannot be easily pumped in continuous reactors based on high recirculation processes. These facts determine a lower limit of water content into the neat soap.



In a JET saponification, this lower limit can be sensibly reduced thanks to the formation of a stable emulsion in a very small volume.

In addition to this, the Atmospheric Reactor or the Crutcher properly operates with any viscosity of the soap thanks to their design.

In case of Semi-Boiled (swing) saponification, the JET allows the production of Concentrated or Semi-Concentrated Soap. Practically it produces a neat soap with the preferred moisture level, avoiding the addition of process water which would be then expensive to evaporate.

A JET Noodling Plant can be completed with a Drying Plant (Drying and Cooling Section) or with a simpler and more economical Cooling Section based on a Chill-Rill (Drum-Flaker). The Chill-Roll option can produce semi-boiled laundry and even toilet soap.

## DOSING GROUP

The JET should be supplied with stoichiometric precision specially in the case of continuous processes.

A modern Dosing Group consists of Gear Pumps driven by Frequency Inverters controlled by electronic Flow Meters.

A SCADA system or a simpler PLC with Touch Screen allows the setting of the formulations.

Usually a triple Dosing Unit supplies to the JET the Oil Blend, the Caustic Soda Solution and the Water or Brine.

## EMULSIFYING JET

Simultaneously to the supply of the reagents, the JET receives a small flow of steam of which, flow and pressure, can be fine-tuned for the formation of the best emulsion.

Steam Injection has several functions:

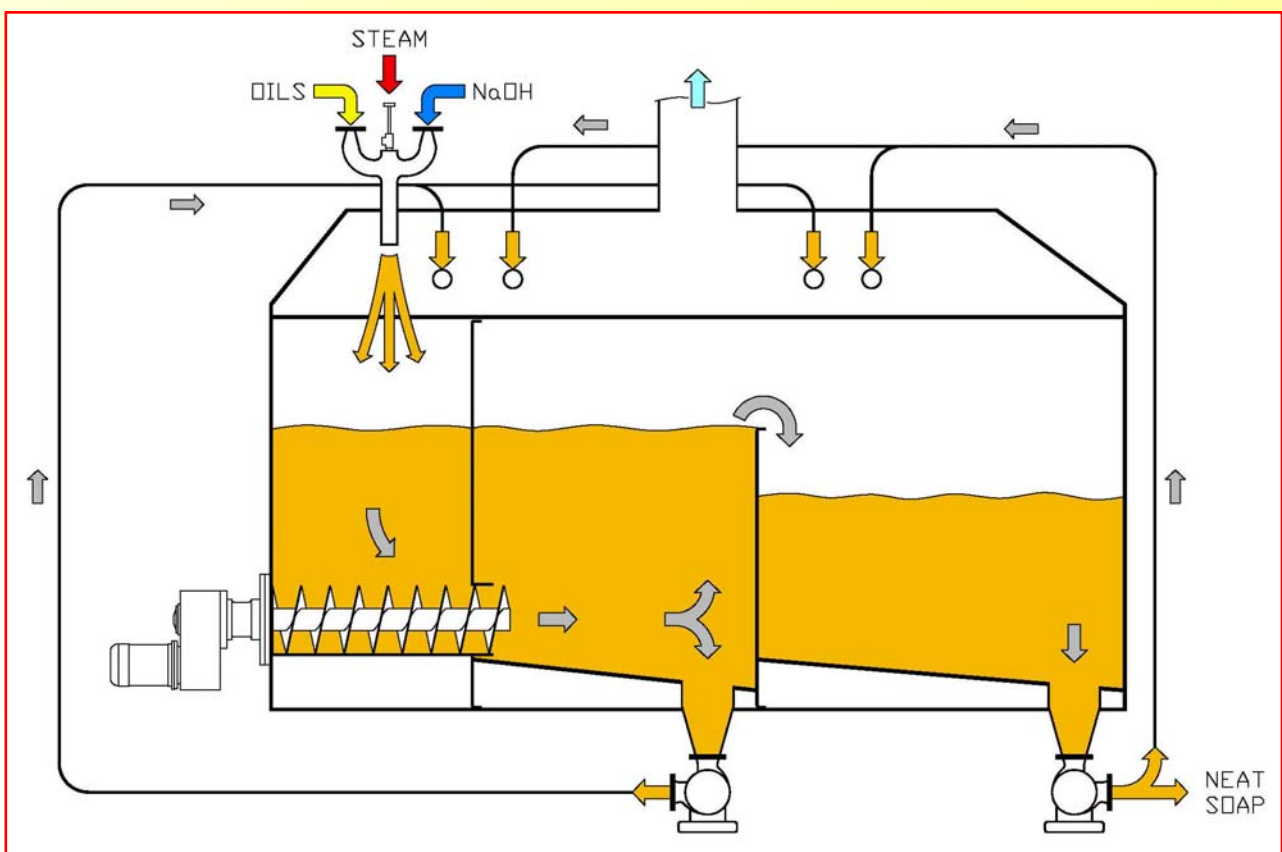
- Provides the necessary kinetic power to generate a great emulsified interphase.
- Triggers the saponification reaction providing the required thermal energy.
- Immediately increases the relative electrolytes percentage so as to allow sudden generation of enough quantity of soap necessary to keep a stable emulsion, whatever the level of free fatty acids might be.

## CONTINUOUS SAPONIFICATION REACTOR

The Reactor is a relatively simple vessel consisting of three stages:

- THE RECEIVING STAGE - Here the JET releases the emulsion. It is completed with a rotating screw which facilitates the passage of the reacting mass to the second stage.
- THE REACTION STAGE – Here the reaction completes its linear phase. On the bottom of this second stage a pump allows the recycle of the soap from the bottom to the top; the same pump is used to empty the two first stages when required. The soap overflows to the third stage.
- THE COMPLETION STAGE - Here the soap matures for a complete saponification. On bottom of such stage a pump delivers the soap to the downstream equipment or, when required, recycles it.

Thanks to its flexible design the described reactor can be also used as a batch plant, in such case the delivery pump is set to the recycle mode until the operator decides to download the soap.



## SPECIAL FEATURES

- The JET technology requires a minimum steam consumption of about 100 kg/h each 1,000 kg/h of produced soap
- The maintenance is simple and minimum. The JET has no moving mechanical parts; the pumps are the only moving parts of the process
- The process is atmospheric
- The plant is user-friendly and is easily controlled by a single operator
- Easy visual access to all process points



## SEMI-CONCENTRATED AND CONCENTRATED SOAPS

In the Full-Boiled processes the process water is abundantly used and remains into the soap. A typical concentration of full-boiled neat soap is 62% TFM and 33% water.

A Semi-Boiled soap obtained with a conventional plant has a typical concentration of 58% TFM (glycerine excluded) and 30% water. The high content of water is necessary to facilitate the saponification and obtain a homogeneous soap mass.

The JET Semi-Boiled saponification allows the production of neat soap at a very wide range of concentrations. It is possible to produce soap at 58% TFM as with a conventional plant and it is possible to produce:

- SEMI-CONCENTRATED SOAP – With a water content in the range of 20%, the soap can be just cooled down, without any evaporation, in order to obtain Laundry Soap or it can be processed by a Drying Plant with reduced Heat Exchanger and reduced Vacuum Section in order to evaporate a limited quantity of moisture and obtain Semi-boiled Toilet Soap.
- CONCENTRATED SOAP – With a water content from 16% down to 12% there is no further scope of drying and the soap is to be cooled down in order to obtain Semi-boiled Toilet Soap. A compact Chill-Roll plant is the ideal heat-exchanger to complete the process without the need of a more complex and consuming Drying Plant.



Raw Materials are dosed into  
the JET, where reaction  
starts immediately



The generated emulsion is in  
form of creamy foam



The emulsion completes the  
reaction by slowly flowing  
through the various stages



Hot Concentrated  
Neat Soap



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