SUCCESS BY
INNOVATION

ENVIRONMENTALLY FRIENDLY DISPOSAL OF SPENT OIL-WATER EMULSIONS

KATPOL CHEMIE

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Large amounts of oil-water emulsions are used as cutting oils in metal treatment. Periodically they have to be replaced due to degradation by microorganisms, oxidation etc.
Oil-water emulsions are also created by various cleaning operations on metal surfaces.
All these emulsions have to be treated by chemical or physical methods before they can be allowed to flow into the municipal water treatment plants or into rivers, the aim of this procedure being to split the emulsions into the water and oil-phases.

The following methods are used in practice:

SEPARATORS

They use centrifugal forces for separation. Difficulties arise with stable emulsions. Another drawback is the high investment which is required.

MEMBRANE SEPARATION

Most important is the ultrafilter process. The feasability of this method is determined by the compatability of the emulsion with the membrane which also effects the frequency with which the filters must be cleaned and replaced. 2-5 bar pressure is required. Water content of the oil phase is approx. 50-60%.

THERMAL METHODS

Mainly distillation. This method is uneconomic under 200 l/hour and the equipment is very expensive.
An organic chemical presplitting is recommended (see next chapter, item b).

FOCULATION, CHEMICAL SPLITTING

This is a highly economic method and no complicated or expensive equipment is necessary.
There are inorganic and organic splitting agents on the market.

a) The traditional inorganic splitting agents Iron-III-chloride, or Aluminiumchloride, in combination with Calciumhydroxide:

The process starts in a acid state and requires therefore considerable measures to prevent corrosion in and around the plant.
It causes large amounts of hydroxide-mud, polluted with oil and other ingredients.
The water content is approx. 50%.
The slurry has to be either burned or deposed, becoming more and more expensive.
This was an increasing incentive for looking for a "mild chemistry" solution for this application:

b) The Organic splitting agents (OS):

They cause no additional mud and no corrosion.
The oil-phase contains approx.30% water. The background of this process is the reaction of the cationic (+) polymeric splitting agent with the emulsion which has normally an anionic(-) character, till the "isoelectric point" is reached. Then the emulsion becomes instable, the oil separates from the waterphase and can easily be creamed off.

For this application we offer a "polyelectrolyte of high positive loading density" with the trade name "POLYQUAT". Chemically it is an aqueous solution of a quarternary ammoniumsalt (20-40%). It is easy to handle, being not sticky and no working solution has to be prepared before application.

POLYQUAT has to be addedd to the emulsion till neutralisation can be recognised either by the colour change of the emulsion or by flocculation.
Overdosage may lead to a deterioration of the splitting result, however danger of "re-emulsion" is far lower than with other OS agents.

If the spent cutting oil or the sewage contains also solids (it is then called a "suspension") a sedimentation of the impurities together with the oil phase occurs.

In order to determine the optimal amount of POLYQUAT to be added a simple scouting-lab test is recommended before application on a technical scale.

For this test into is recommended to prepare a 5% aqueous solution of POLYQUAT as supplied.
Normally POLYQUAT 20 U 050 is used. 500 ml of the emulsion is measured into a beaker-glass and stirred vigorously. Now add the 5% solution milliliterwise until the described change of the emulsion (or suspension) can be observed. Stop stirring and judge the result.
For optimisation and acceleration several beaker-glasses/stirrers can be used. With this method the stage of over-dosing can be easily recognised.

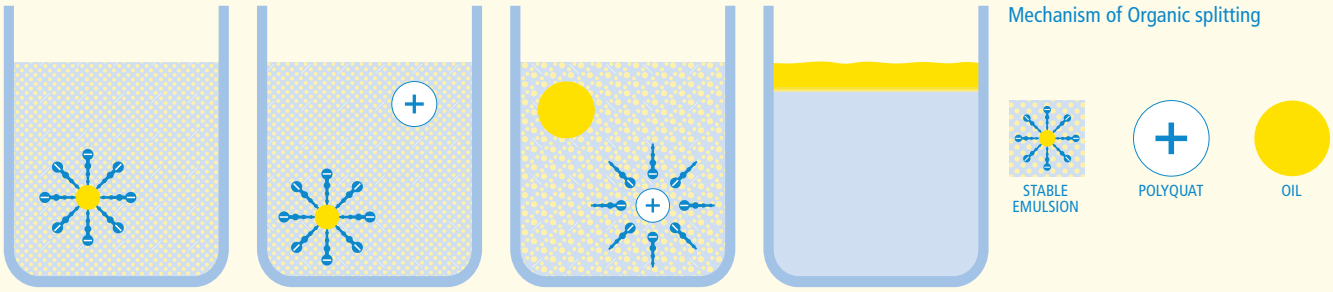
Normally 500-2.000 ppm POLYQUAT is needed to break the emulsions/suspensions. High viscosity-emulsions e.g. coming

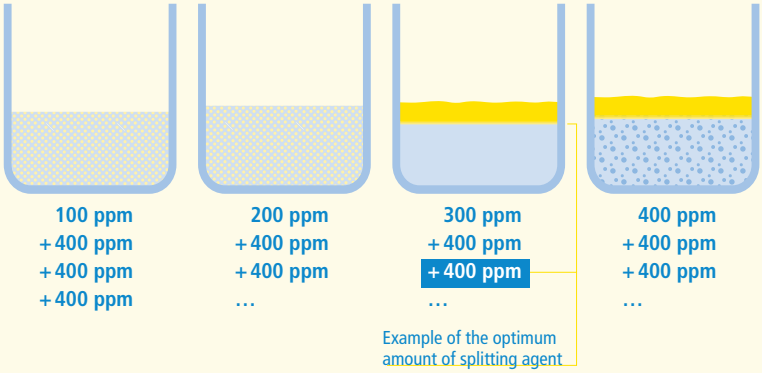
from the ultrafilterprocess ("retentates") may require up to 6.000-8.000 ppm.

For working on a technical scale POLYQUAT should be used as supplied. It must be well mixed into the suspension either by stirring or by bubbling with compressed air. Then the mixing procedure can be stopped and separation commences.

Depending on the available equipment, the lower phase (in most cases the water phase) can be drained off. Alternatively the upper (oil containing) phase can be skimmed off.

With heavy metal content, an aftertreatment with Iron-III-chloride/Sodiumhydroxide or Calciumhydroxyde may be useful, however the necessary amount is far lower than with the pure inorganic method. Consequently the amount of mud that is produced is far lower as well.





Arrangement of four beakerglasses to determine the amount of splitting agent

All information given above is to our best knowledge. A guarantee for the field application cannot be given, as the precise circumstances are out of our control.

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