

THE PROBLEM OF FORMATION, RECYCLING AND UTILIZATION OF OIL SLOPS

A.G. Gerasimova, Y.A. Kirillova
Scientific supervisor V.A. Gron
Language supervisor E.I. Fomina
Siberian Federal University

The essential problem of crude oil refining productions is oil slops formation, recycling, and utilization. Particularly the Paiginsk oil and gas deposit attracts practical interest of refining slop products process on oil-refining smelter Taymura.

Taymura is the smelter that makes products of processing oil and specializes on the production of paraffin oil, residual oil and etc. The smelter is based on chemical, oil and gas processes and pollutes environment with gas, solid and liquid wastes.

Initial products enter to the oil-refining smelter Taymura from wellsite in crude oil pipeline. There are a lot of slops on the territory of the smelter containing oil, water and solid phase, accumulating in settling pond and reaching critical rate. The problem of effective oil slops utilization is an important ecological and resource saving issue under the modern condition licensing and land uptake.

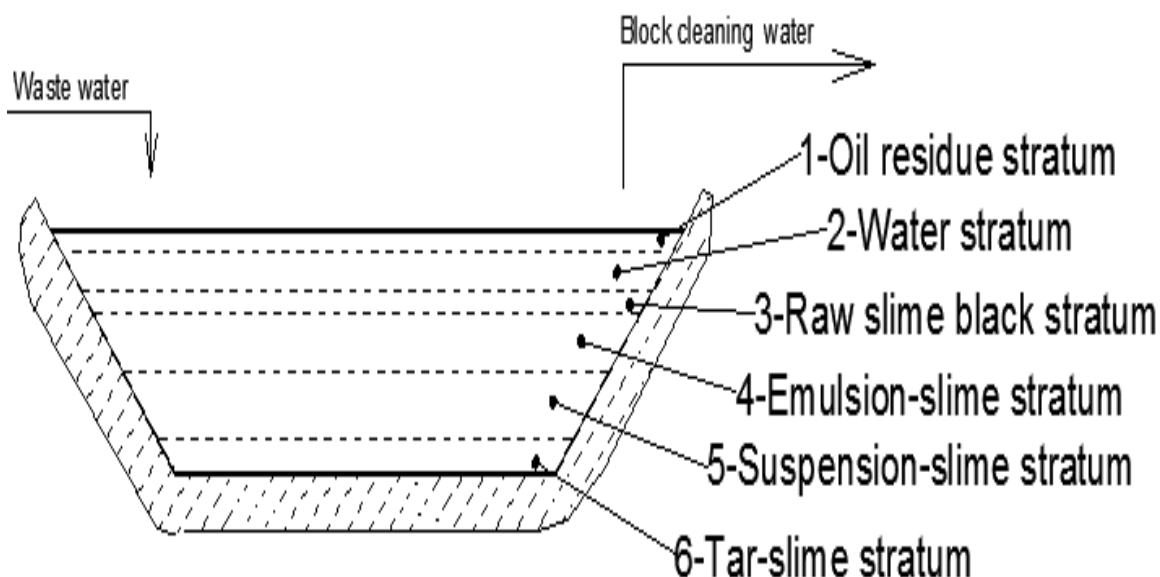
The difficulty of the situation is connected with the contradiction between growing range of industrial production and imperfect technology.

The aim of the research is to develop refining technology for recycling raw or accumulated oil slops.

Plan:

- 1 To learn phases of oil slops formation
- 2 To analyze modern utilization and recycling technologies
- 3 To choose and prove technological arrangement of oil slops utilization for Taymura smelter

Practically, during longtime keeping in containers, slops decompose on several stratum with peculiar characteristics. On the picture 1 oil slops stratum are performed.



Picture 1 – Oil slops stratum

For example, oil residue stratum is the first in slop and should be returned into technological circle for recycling, as about 97,99% of slime is clean oil product. Water stratum is technologically cleared by gravity separation: light suspended solid particles rise to the surface, weighty ones fall. Stratum from 3 to 6 are oil slops. Residue concentration grows up in

extent of oil products with increase of their molecular weight (to weighty oil particles). Besides, polydisperse systems are formed in fluid of oil products while transporting and stowage [4].

Oil slops can be characterized by 3 phases: 2 non-miscible liquids (water and hydrocarbon phases) and solid phase (physical impurities). For research purpose, phase composition of oil slops was studied by the following methods [4], [5]:

- 1 the method attenuate-lysing
- 2 the method distilling- lysing

As a result we see that in the second method physical impurities are higher as flushing out of residue with toluene does not provide missing physical impurities. Practically it would be better to apply both methods.

Analyzing modern oil slops utilization technology, we can determine the most progressive ones:

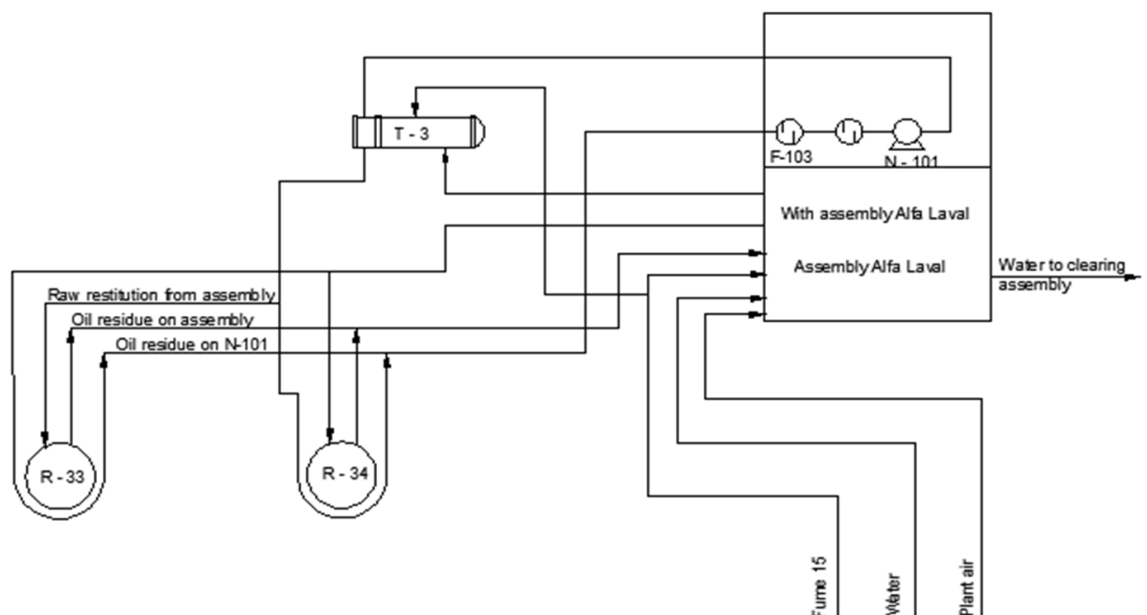
Company Aristocrat AC8 (USA) has developed system of refining and clearing oil waste MTU 530. Assembly is able to separate slops to different phases (oil, water, solid matter) at the expense whizzing heating slop. Assembly is used for elimination the aftermath of oil-pipe line emergency. Assembly efficiency is 10 m³/h.

Company KHD Humboldt Wedag AG (Germany) suggests technology for separation slops to phases with following burning of slimes. Assembly efficiency is 10 m³/h. Practically the method is impossible to use for recycling wastes if it contains phosphorus, halogens, sulfur. In this case there can be formed reaction products with toxicity level in excess of standards [1].

However these slops utilization technologies are not suitable for recycling large extent of slops, that accumulating on oil-refining smelter. It is required such technology that would allow recycling mighty extent of oil slops in short time. It must be sustainable and commercial viable.

Special interest is paid to complex assembly, developed by Alfa Laval Oil Field, Ltd (Great Brittan) that allows recycling all types of slimes to valuable products. (*Blocks, advantages and efficiency*). Currently more perspective recycling slimes assembly is used for separation compound to oil product, water and solid residue, purposely following utilization weather water or solid phase.

Considering phase compound of oil slops, we suggest effective recycling technology for the smelter Taymura using assembly by Alfa Laval Oil Field, Ltd. The assembly kit contains: sample catcher, heat interchangers, raw containers and separator. On the picture 2 technological process of slime recycling are performed [2].



Picture 2 – Technological process of slime recycling

Technological process of slime recycling with suggested assembly is effective in a certain way. From the sample catcher a slop is moved to raw container with intake, where getting ready

before moving to separator. Firstly, a container is filled to the top level (7,35m), than passes on extra container and the filled container enters the system of raw preparing. Than pump brings into operation and raw moves to heat interchanger, though filter and returns to washing out arrangement. In such way the steady circle works: container → pump → heat interchanger → container. Via control the heat interchangers slime temperature attains 65 °C. Under attainment necessary temperature and homogeneity, slop moves to separator.

The assembly works 24-hour operation and about 7000 hours a year recycling 70 000 m³ oil slops at supply of raw with nominal characteristics.

The correct assembly exploitation provides getting following recycling products: oil phase (where water substance is no more than 1 % and physical impurities are no more than 0,05 %), cleaned water, slime, that is used as element of pavement surfacing.

As a result, considering assembly's advantages and particular qualities, the technology solves the following problems of oil-refining smelter Taymura:

- clearing containers
- excluding growth and accumulating of oil slimes and bottom residues
- liquidating oil slops
- liquidating oil slops vaporization to environment
- preventing pollution of ground water

That is why the technology is effective in ecological and economical way.

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