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The effect of demulsifier and mixing intensity of sobhasan crude emulsion on dynamic vicosity and demulsification process

M.P.Tiwari*, J.S.Jangwan

Department of Chemistry, H.N.B.Garhwal University, Campus Badshahithaul, Tehri, Uttrakhand-249199, (INDIA)

Tel : 9837229738, 0136-232277

E-mail : drmahidhar.tiwari7@gmail.com, jsjangwan@yahoo.co.in

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ABSTRACT

In the study of effect of a Demulsifier on the dynamic viscosity of Sobhasan emulsion and a high-speed stirrer (4,000 rpm) was used to study the effect of mixing intensity on demulsification.The Demulsifier used in ACENOL TEDX in each test, the demulsifier was mixed emulsion by a stirrer working at 4000rpm for one half minute. Lesser or higher mixing times have shown adverse effect.

KEYWORDS

Solublised oil;
Resolution;
Synergistic effect;
Demulsificationrate;
Optimal conditions.

INTRODUCTION

According to the studies stability of emulsion and the dose change with the water content and nature of oil, below and above optimum dose the demulsification efficiency decreases. The stability of emulsion w/o has been correlated to the change in its dynamic viscosity. It is reported that dynamic viscosity shows a minima at the optimum dose of demulsifiers. At Optimum concentration of demulsifiers. The overall programmed of demulsification can be improved by ensuring optimum mixing intensity and mixing time. One way to improve oil water separation would be to increase the demulsify dose, resulting increased operating expenses the other alternative is to try to improve the coalescence condition,keeping demulsifier concentration constant. The effect of mixing intensity on the process of demulsification can be quantitatively studies in laboratory by employing high speed stirrer for specific period of time.

EXPERIMENTAL

Materials and methods

The present studies have been conducted on 15 months aged sobhasan emulsion in KDMIPE, ONGC, Dehradun. There are no. of methods used for breaking down petroleum emulsions of which the most common of these employed centrifuges, filters, chemical additives and electrical treatment, etc. In the study, a high speed stirrer was used to study the effect of mixing intensity on demulsification

RESULT AND DISCUSSION

The data obtained shows the dynamic viscosity minima at a dose of 8000mg/l of demulsifiers acenol

TABLE 1 : Effect of demulsifier on the dynamic viscosity at 30^{0}C

S.no.	ACNOL TEDX additional PPM	Dynamic viscosity
1	0	1440.26
2	1000	1432.26
3	2000	1236.44
4	3000	836.9
5	4000	836.9
6	5000	791.17
7	6000	656.99
8	8000	418.46
9	10000	715.6

TABLE 2 : Study report tabulated of the effect of mixing intensity on demulsification

Dope Mg/1	Temp ^{0}C	Rev./ min (rpm)	De-emulsification behaviour 1 min				
			1 min	1.5min.	3min.	4min.	5min.
8000	65	4000	Stable	Unstable	Stable	Stable	Stable

TABLE 3: Results of de-emulsification with 8000 ppm. DOPE AND 5000ppm. Dope at 80^{0}C and 65^{0}C

Obsno	Demulsifiers Dope mg/l	Tem ^{0}C	Water separation from 100ml of emulsions 1hr	2hr	3h	4 hr	Over night at room tem.
1	8000	80^{0}C	20	32	35	35	35
2	8000	65^{0}C	13	25	32	36	34
3	5000	65^{0}C	10	13	16	17	20

TABLE 4 : Results of improving the resolution of sobhasan with lower concentration by changing the pH using N/2 NaOH

Obsno	Demulsifiers Dope mg/l	Tem	pH	Water separation from 100ml of emulsions 1hr	2hr	3hr	4hr	Over night at room tem.
1	5000	65^{0}C	9.00	10	18	20	28	38
2	5000	65^{0}C	9.5	13	20	27	34	35
3	5000	65^{0}C	10.0	15	22	32	37	38

TABLE 5 : Effect of mixing intensity of sobhasan crude emulsion of de-emulsification with different concentration at 9.5 pH value and 65^{0}C

Obsno	Demulsifiers Dope mg/l	Tem	pH	Water separation from 100ml of emulsions 1hr	2hr	3hr	4hr	Over night at room tem.
1	3000	65^{0}C	9.5	Nil	Nil	Nil	Nil	nil
2	4000	65^{0}C	9.5	09	08	21	24	25
3	5000	65^{0}C	9.5	13	33	33	35	34

tedx and such this can be taken as the optimum dose are tabulated in TABLE 1. Based on proceeding work the optimal conditions for effective demulsification (65^{0}C) are tabulated in TABLE 2. Experiments demulsification at 80^{0}C were also carried out. So, demulsification was attempted both at 80^{0}C and 65^{0}C. The results obtained are shown in TABLE 3. The demulsified water separated with 8000mg/1 demulsifier dope was highly turbid due to high content of solublized oil in water so the further tests were conducted with 5000mg/1 of demulsifier is also shown in TABLE 4. As is evident decrease in demulsifier concentration appreciably reduces the resolution of emulsion. An attempt was accordingly made to improve the resolution by changing the pH using N/2 NaOH. The results are shown in TABLE 4 the emulsion shows maximum instability at 9.5pH. Incidentally the water resolved at this pH using 5000ppm of demulsifier was found to be clearer as compared to one obtained at 8000ppm does indicating better quality of resolution. At 9.5 pH lower doses of demulsifier were also tried without success.

The accitateration in demulsification rate at pH=9.5 confirms the view that sobhasan emulsion is primarily stabilized by asphaltic films because these materials are strongly effected by pH. The drop in demulsifiers dose and temperature from 8000mg/l to 5000mg/l and 80^{0}C to 65^{0}C respectively confirms that interfacial films is thinned at pH=9.5 and probably the film ratio has decreased to maximum. The temperature alone magnifies the effect of pH at the interface and the bulk. The amount of inhibiting cations for clay i.e. Ca^{++} and Mg^{++} were found to be very low. It can, therefore, be argued that the alkaline pH would easily disperse the clay into the water phase and minimize the stability of emulsion due to clay. The tolerance of the mixing time at pH=9.5 might be expected due to equilibrium particle size distribution after they are destabilized by the addition of demulsifier.

CONCLUSION

At constant mixing intensity and demulsifier concentration,the water separation and thus the degree of coalescence increase with residence time. For long retention times the water separation approaches a constant value, this suggested the equilibrium droplets sizes constant at certain mixing intensity. At constant mixing intensity a reduction in degree of coalescence as a result of shortest residence time can be partly compensated by increasing the demulsifier concentration. There is an optimum mixing intensity for which the degree of coalescence is highest. demulsification is the very useful in water pollution viz; purification of water, removal of solute, water treatment,formulation for treating hydrocarbon-polluted water etc.

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