OIL POLLUTION ALONG GUJARAT COAST AND ITS POSSIBLE SOURCE

ABSTRACT

The incidence of pollution by oil derivatives along the Indian coastline, in the form of tar-ball deposition on beaches of Gujerat is dealt with. The possible origin of the tar-balls has been traced to crude and other heavy fractions of petroleum, by using thin layer chromatography (TLC) technique A comparison has been made of different oil derivatives which led to the deduction that the tar-ball ball material comes from crude-oil.

In the various parts of the world ocean, particularly in the Atlantic Ocean and the Mediterraneam Sea, oil pollution has assumed alarming proportions (Nelson-Smith, 1972). The importance and magnitude of oil pollution has been recognised (Ruivo, 1972) and methods are being worked out to determine the causes, intensity and the degradation process of oil derviatives in the marine environments (Anon 1972, 1974).

In India, along the central west coast, traces of of oil pollution were first recorded in 1971 (Nair et al, 1972). During 1972–73, seasonal occurrence was extensively investigated. The quantitative incidence of oil pollution, its seasonal nature and accumulation of tar-balls on the beaches, were investigated along the west and east coastline of India (Dwivedi and Parulekar, 1974). This data indicated that the tar-ball material probably originated from the caleaning of bilch tanks, washing of oil tankers, spillages either due to accident or during the handling of oil cargo.

The fate of the oil in the sea has been discussed (Blumer, 1970; Zobell, 1969), in detail. The cumulative effect on the degrading process at first results in the evaporation of lighter fractions like petrol, diesel, kerosene etc. The remaining part becomes inert and is apparently harmless to marine life (Parker et al. 1971). The inert part remains floating or gets settled at the bottom. Subsequently, with the advent of monsoon it is washed ashore. This phenomenon has been occurring along all parts of the Indian coastline (Dwivedi & Parulekar 1974). During July 1973, a detailed survey on the incidence of pollution by tar-balls was conducted from Bombay to Okha. The results of this survey have been summarised in Table 1.

The composition of tar-balls which are washed ashore showed a common or comparable source of origin (Reddy & Singbal, 1973). However, more detailed investigations were necessary to establish conclusively, the possible source of oil pollution. Hence, samples of tar-balls collected from the diffenent parts of Gujerat coast were studied by thin layer chromatography (TLC) technique.

TABLE - I

Summary of the survey showing deposition at different tide levels

Sl. No.	Station	Type of beach	Deposition (g/m^2) at different tide levels				Remarks
			EHWS	HTL	MTL	LTL	
1	Porbander	Open sea	2.28	31.45	—	—	Wave action very high
2	Odedar	Open sea	230.50	90.00	15.25	—	Beach gradient very steep. Algal growth on the deposit.
3	Cosabara	Estuarine	750.01	2375.00	630.00	—	Plastic beads embedded in deposits
4	Veraval	Open sea	5.30	165.50	1.73	—	Goose barnacles (*Lepas* sp.) on coal tar lumps
5	Prabhas-puttam Somnath	Open Sea	6.25	250.90	3.24	0.72	Plastic beads and (*Lepas* sp.) found associated with deposition
6	Dumas Surat	Estuarine influence	1.05	15.25	—	—	Traces of oil-film in the intertidal region.

EHWS Extreme High Water of Springs MTL Mid Tide
HTL High Tide Level LTL Low Tide Level

Concentrated solution of different oil derivatives, like, crude, wax lubricants, kerosene and diesel in hexane were prepared and applied on a thin layer of silica gel on a glass plate. The spots were allowed to dry at room temperature and then the plates were kept in the development chamber till the solvent migrated over a distance of 4 cm along the channels. The plates were then removed and the solvent was allowed to evaporate. Later, the plates were exposed to iodine vapours which developed the characteristic pattern of each substance in the channel. The TLC analyses were repeated several times with each substance to determine and establish a definite and reproducible pattern.

The TLC patterns of road tar (RT), crude oil (CR), wax (WX) high flow diesel (HF), kerosene (KS) and light diesel (DL) are given in Fig. 1. These

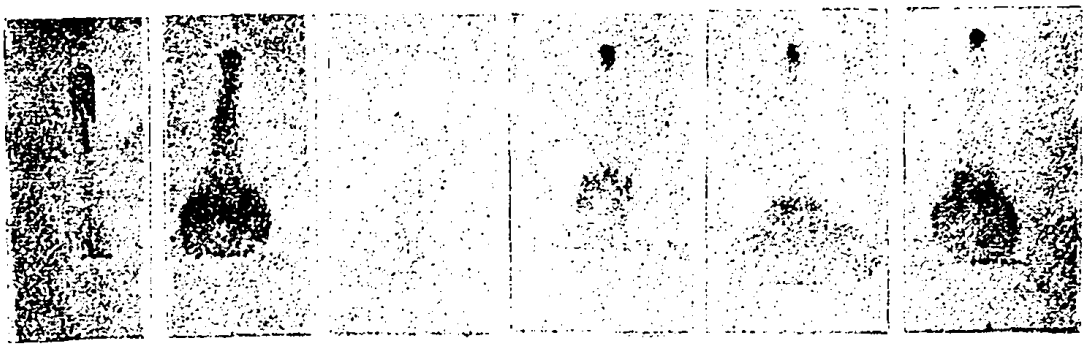

Fig. 1 TLC pattern of road tar (RT), crude oil (CR), wax (WX), high flow diesel (HF), Kerosene (KS) and light diesel oil (DL)

stable patterns can be taken as standard for comparing the mobility of these fractions with the unknown factors of crude and various other oils. The crude oil patterns show that the less mobile fractions are at the bottom and the more mobile fractions move upwards.

The TLC patterns of the tar collected from the beaches of Veraval (VT), Dumas (DT), Somnath (ST) and Gosabara (GT) are given in Fig. 2. The TLC plates, so obtained, are comparaple with the crude and other heavy oils. However, they differ in the intensity of the volatile materials which evaporate with time and during the process of

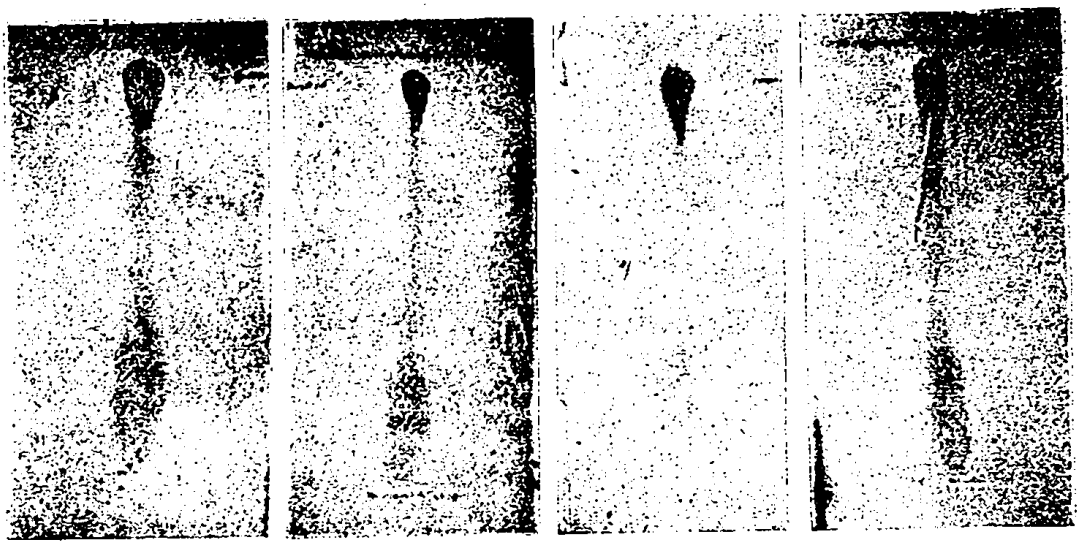

Fig. 2 TLC pattern of tar-balls collected from Veraval (VT), Dumas (DT), Somnath (ST) and Gosabara (GT) along the Gujerat coast.

degradation. The RF values (ratio between the distance travelled by the solute and the distance travelled by the solvent) of tar and crude clearly indicates the close resemblance of tar-balls to crude and other heavy fractions of oil, as far as the source os origin is concerned. Hence, it may be inferred that the increase in the deposition of tar-ball on the beaches is due to an increase in shipping and because of increasing movement of crude oil along our coastline. Utmost care and preventive measures are necessary at the national level to combat pollution due to oil.

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