Letters

Recycled Oil

There are several minor misconceptions in Thomas H. Maugh's excellent article "Rerefined oil: An option that saves oil, minimizes pollution" (Research News, 17 Sept., p. 1108). These concern efforts by the National Bureau of Standards (NBS) to fulfill the Energy Policy and Conservation Act of 1975 (Public Law 94-163).

Maugh states that NBS is to "... demonstrate the equivalency of rerefined and virgin lubricating oils. ..." Actually, the law states that NBS is to "... develop test procedures *for determination of* substantial equivalency of re-refined or otherwise processed used oil ... with new oil for a particular end use [italics ours]." Thus, NBS is to provide test procedures that can be used to determine the equivalency of a particular sample, on a sample-to-sample basis. This is substantially different from demonstrating equivalency, which could be interpreted to mean that, once equivalency is demonstrated, by whatever means, the problem is solved.

Also, Maugh states that NBS is required to "... develop simpler ways to measure the quality of lubricating oils." The law does not include that statement, nor any portion of it. While we agree that "simpler ways" would be desirable, such developments are thought to be highly unlikely by experts in the field and would be a side benefit of the NBS program, not a requirement under the law.

Finally, it is important to comment on the comprehensiveness of the law. While Maugh discusses only used oils recycled as engine lubricating oils, the law covers "... re-refined or otherwise processed used oil or blend of oil ...," which in our judgment includes such end use products as industrial oils, metal-working oils, hydraulic oils, and oils used for fuel, as well as engine (both crankcase and transmission) oils.

Each of these categories of oils has one or more individual sets of specifications, test procedures, and problems. In addition, each category of oil consists of different types [for example, fuel oil has six grades; there are apparently at least 15 different types of hydraulic oils that are widely used; engine oils include crankcase oils (the SA grade requires no performance tests; the SE grade requires costly engine sequence tests) as well as transmission oils]. All petroleum-based oils are covered under the Energy Policy and Conservation Act.

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Nuclear Reactor Accidents: Long-Term Health Effects

The 11 June congressional testimony of Panofsky, von Hippel, and Rowe, as reported by Philip M. Boffey (News and Comment, 25 June, p. 1312), is critical of the treatment of long-term health effects from reactor accidents in the Rasmussen report (*1*). This general criticism was first raised in the American Physical Society (APS) study of reactor safety (*2*), of which Panofsky and von Hippel were major participants. A review of the APS study, however, leads one to question whether its widely quoted results, and the criticisms in the congressional testimony, are valid (*3*).

The APS study considers the long-term health effects of radioactive release from a postulated reference accident with an estimated probability of occurrence of once per 160,000 years of reactor operation. The effects from cesium-137, the major cause of predicted cancer deaths, are treated in detail. In the APS study it is calculated that the long-term population dose of cesium-137 is 70 million man-rems. By use of the linear theory of radiation health effects and (*4*), this figure is equated to 9000 predicted cancer deaths (130 deaths per 10^6 man-rems).

Although the 70 million man-rem figure is large, it represents the integrated radiation dose to a population of 9 million people over a number of decades. The basic question to be answered is, What health effects result from the individual exposures comprising the integrated dose?

Exposures to individuals are not specifically presented in the APS study but can be derived from the report. Table 1 shows the radiation exposure at the highest dose point considered in the APS study, 60 kilometers from the site of the accident. It also shows the point, 420 km from the accident, where the integrated population dose (70 million man-rems) divides into two equal parts, half incurred inside the 420-km radius and half outside. Thus, half of the integrated population dose (35 million man-rems) is due to individual radiation exposures less than those in the last two columns of the table.

Table 1. Exposure of an individual to cesium-137 from a nuclear reactor accident [reference accident from (*2*)].

Time after accident (yr)	Highest dose point (60 km)		Population dose midpoint (420 km)	
	Dose rate (rem/yr)	Integrated dose (rems)	Dose rate (rem/yr)	Integrated dose (rems)
0	4	0	0.57	0
1	2.2	2.9	0.31	0.41
2	1.6	4.8	0.23	0.69
3	1.4	6.3	0.20	0.90
4	1.3	7.7	0.19	1.1
5	1.3	9	0.18	1.3
10	1.1	15	0.16	2.1
20	0.81	24	0.12	3.4
30	0.60	31	0.09	4.5
40	0.45	36	0.06	5.1
50	0.33	40	0.05	5.7
70	0.18	45	0.03	6.5
∞	0	52	0	7.4

The figures shown in Table 1 are noteworthy for their relatively small values. Even the annual dose rates at the highest dose point are below the occupational exposure limits set by the National Council on Radiological Protection and Measurement (NCRP) (*5*, *6*). The NCRP limits are such that "it is impossible to find any evidence of injuries either directly or by statistical means for people working within and living within such limits" (*7*). The difference between this statement and the figure in the APS study of 9000 deaths results from the use in that study of the linear theory of radiation effects, which attempts to extrapolate data from high-dose, high-dose rate exposures to