

to the editor

Fluorocarbon engines

Re your article on steam cars (SN: 9/20, p. 248):

In this article your usually precise magazine carries some misstatements regarding Freon, which we feel require correction.

Your article states, "At temperatures above 290 degrees F. it decomposes into phosgene and hydrogen chloride. Toxicity is the concern here coupled with damage to metal parts."

It is impossible for clean, dry Freon in a sealed system to decompose into phosgene and hydrogen chloride, since the elements oxygen and hydrogen (which are essential constituents of phosgene and hydrogen chloride) are not present, and thus, these compounds cannot be formed. In the event that air is present in the system and the Freon is heated excessively, the product of oxidation is carbon dioxide, a nontoxic and essentially noncorrosive substance.

As to the temperature of decomposition: the word "Freon" does not refer to a single compound, but is merely a trademark used by the DuPont Co. for the entire class of halogenated hydrocarbons which they manufacture, and each compound has distinct chemical and physical characteristics which cover a very wide spectrum. The compound to which you probably refer is Freon-11 since that is the one which we have most often mentioned publicly and to Lear. Technical data provided by Dupont show that the temperature of decomposition depends primarily upon the material of the containers with which it is in contact. F-11 in quartz or glass containers does not begin to decompose until a temperature of 840 degrees F. is reached, at which

time the pressure produced by the vapor is at several tons per square inch. At our usual operating pressure of 500 pounds per square inch the temperature of F-11 would be only 360 degrees F. You will further note from technical data supplied by DuPont, that the decomposition rate of F-11 in ordinary steel containers amounts to only 2 percent per year at 400 degrees F.

Most important, there are numerous other fluorocarbons manufactured by Allied Chemical, Union Carbide, and 3-M Corp. which also have thermodynamic properties similar to F-11 and suitability for use in a Rankine cycle engine, which are markedly more stable. For some of these compounds the decomposition rate in steel is negligibly small at 700 degrees F. As an example, the metal corrosion rate of one of these fluorocarbons amounts to less than $\frac{1}{1000}$ of an inch per year at 750 degrees F., the temperature corresponding to a pressure of several tons per square inch.

As a scientist familiar with the properties of polywater, I do not understand how anyone could seriously propose its use to drive a vapor engine, since it does not vaporize even at atmospheric pressure below a bright red heat; and upon vaporization, it reverts to ordinary water, which upon recondensing no longer has the properties of polywater. Obviously, a single-pass fluid has no practical utility in a Rankine engine even if it were as cheap as ordinary distilled water.

Wallace L. Minto, President
Kinetics Corp.
Sarasota, Fla.

(There are two separate processes to be considered here: a reaction and a decomposition. Since there is no such thing as a sealed system in automotive engineering, the Freon would react with water and lubricating oil, rather than decompose, to form hydrogen

chloride. Phosgene is a minor worry and would only be produced if there were an accident and the Freon contacted a flame.

As for decomposition, the tables from DuPont show phenomenal increases in decomposition rates, dependent on the temperature and the material it contacts. For example, Freon-11 in contact with steel at 480 degrees F. shows a decomposition rate of 120 percent per year. At 570 degrees it is 600 percent per year and at 660 degrees it is 4,700 percent per year.

Lear Motors still maintains it is experimenting with polywater, but now describes the research as very "blue sky."

Mr. Minto describes Kinetics Corp. as "the leaders in the field of fluorocarbon engines." Ed.)

No return to taxpayer

I read with interest the claim ("Assault on the Drug Jam," SN: 10/11, p. 325) that "each institution insists on proprietary rights to drug finds that Government finances, universities make and companies screen and develop." All three, when asked, will continue to claim priority rights, for the simple reason that some of the newly developed drugs do turn out to be real money makers, and all three have helped.

The Government should not claim any rebate, for the simple reason that money used for grants for graduate study has come from taxes, paid by the public, and has been allotted so that students might continue their higher education. The universities should get a fair return; but the drug companies should get the real profit. As the article stated, several million dollars and five to seven years might be spent "just to bring a single drug out." They also spend much money, time, and effort working on drugs that do not prove marketable. There is also competition with other drug companies who are doing similar research, so that ultimate cost to the public must be a competitive price.

Universities train the chemists, and provide the materials for study. They should get back cost of materials only, or at least not more than double the amount—either this, or have a set price to drug companies, set by the university, but checked by the committee giving the Government grants.

Marcia G. Norton
Orient, Wash.

Address communications to Editor,
Science News, 1719 N Street, N.W.,
Washington, D. C. 20036

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Director: EARL J. SCHERAGO

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