WESTERN PETROLEUM REFINERS ASSOCATION

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Within recent months there have appeared in various newspapers and trade journals certain articles describing briefly a new additive known as "PD" combustion catalyst. This catalyst, according to these reports, when used in connection with regular gasoline was capable of improving the combustion characteristics of the gasoline considerably. Other benefits claimed are engine cleanliness and more miles per gallon of fuel in the consuming vehicle. These news articles also referred to the satisfactory use of "PD" compound in fuel oils.

Because of the industry's interest in both of the above fields, we submit the following information:

"PD" combustion catalyst is manufactured by the Motor Chemical Corporation, 840 North Michigan Avenue, Chicago, Illinois. Its directorship consists of the following persons:

C. L. Wallace, President
W. W. Whitnell, Secretary-Treasurer (Secretary-Treasurer, National Cylinder Gas Company)
Waldo Logan
Charles Haines (President, National Cylinder Gas Company)
James Dunham (Executive Vice President, National Cylinder Gas Company)
Walter Hallanan (President, Plymouth Oil Company)
William Huston (President, Republic Oil & Refining Company)
Dean D. Francis (Director, Borg-Warner Corporation)

"PD" COMBUSTION CATALYST

Description

"PD" 1132-B is a compound of metals having as its principal effective agents the metals cobalt and chromium. It comprises 80% cobaltic acetylacetonate and 20% chromic acelylacetonate. In this form it is a powder that is soluble in gasoline. The amount of powder required to treat one gallon of fuel is so small that, for convenience, a concentrated solution is available for sale. This solution usually consists of the powder and benzol. The price of this solution

is reported as approximately $6.00 per gallon. The recommended quantity of solution is 2.0 cc's per gallon of fuel oil. For gasoline, 4 cc's per gallon is recommended. "PD" is said to be non-toxic. Motor Chemical Corporation claims that "PD" does not affect the fuel chemically and may be classed as inert to the point of combustion. During combustion the metal compounds are converted to cobalt and chromium oxides which are recognized catalysts. In minute form these oxides deposit on the walls of combustion chambers. Cobalt oxide functions by decomposing peroxides in the unburned portion of the fuel. Chromic oxide promotes the catalytic activity of the cobalt oxide and accelerates completion of the combustion cycle.

Origin of "PD" 1132-B

The numerous patents which include "PD" 1132-B cover many metals. The conception and invention of "PD" originated in a spark plug wire. Beginning in 1918 in Chicago, Willard E. Lyons developed and for twelve years manufactured the "Lynamite" spark plug. This plug maintained its market by reason of "firing through oil" as a result of a patented auxiliary gap in the head of the plug.

In 1930 friends of Mr. Lyons began, experimentally, the cracking of crude oil by a palladium metal catalyst. The dehydrogenation and oxidation activity of palladium on heavy hydrocarbon vapors appealed to Mr. Lyons as a valuable function to be embodied in a spark plug electrode wire. Mr. Lyons secured patent rights for this function.

Subsequently, F. W. Lewis, G. E. Hendricks and W. E. Lyons formed the Hendricks Research Corporation to develop this new spark plug and soon thereafter its activity was affiliated with the Leo Corporation. Thomas H. Dee and Company, Chicago, provided nickel wire covered with a thin palladium sleeve. Palladium spark plugs were built and tested. Tests showed an improvement in combustion efficiency of the fuel and absence of carbon deposits on insulator and electrodes due to the cracking, dehydrogenation and oxidation activity of the palladium catalyst on oil normally accumulating and carbonizing.

The next step was logical. If the small surface of palladium wire was so important, why not try to put palladium in the fuel and thus spread its activity throughout the entire charge. Chemists of Hendricks Research Corporation were put to work on the problem and the result was Palladium Di-Ethyl Sulphide, soluble in gasoline. Dynamometer and road tests of the new fuel surpassed expectations. From then on all activity of the Leo Corporation was directed toward motor fuel development. Chief drawbacks were cost and a limited supply of palladium.

Believing that the clue might be in the known fact that palladium functioned as a dehydrogenation catalyst, Mr. Lyons searched for other and cheaper substitutes. Among others, organic compounds of cobalt and nickel were made and tested. They proved not only cheaper but more effective than palladium because the deposits of cobalt and nickel oxides in the combustion chamber provided values beyond the power of palladium. However, the goal was not yet reached. It was found that the cobalt-nickel combination was commercially effective only in gasoline which did

not contain tetra-ethyl lead. This necessitated continued research. Finally in 1941 the solution arrived. It was discovered that chromium, although not possessing any function of its own, acted as a promoter catalyst, increased the catalytic activity of cobalt and that the two metals in combination were fully operative in leaded as well as unleaded gasolines.

Patents

The patent structure began with the filing of applications in the years 1935 and 1936, and have been progressively followed since that time through Mr. Lyons and his associates of the firm of Charles W. Hills, Patent Attorneys, Chicago, Illinois. The patents were allowed beginning in 1937 through 1940. The patents cover the use of 35 metals, some of which are claimed to have anti-knock properties and some pro-knock qualities, the latter being essential in Diesel fuels. The patents also cover the process of manufacture as well as the concentration of metals by weight in fuels.

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