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Corrosion problems in an ammonium sulfate plant, plus a telephone cable layer, did big things for anhydrous ammonia

ONE DAY IN 1939, Alvin Cox, then head of California's Bureau of Chemistry, was following a strange-looking rig along a furrow near Santa Paula. The rig was injecting anhydrous ammonia directly into the soil. Under the watchful eye of his host, F. Haven Leavitt, Cox was sniffing for traces of ammonia. Smelling none, he bent lower. He wound up following the rig on hands and knees, his nose almost buried in the furrow.

Later, Leavitt filed patent applications on both the injection technique and the tools. (U. S. Patents 2,285,932 and 2,306,339 issued in 1942; both were assigned to Shell Chemical.)

That 1939 test was an early part of the second step in fertilizing directly with anhydrous ammonia. The first had started in 1932 during discussions of a major overhaul at Shell Chemical's ammonium sulfate plant at Pittsburg, Calif. Making sulfate in that day raised costly corrosion problems. Ludwig Rosenstein, then chief chemist for Shell Chemical and now a consultant in San Francisco, came up with an idea. Why not bypass some of these problems by fertilizing directly with ammonia (Shell made its own)?

A few hearty laughs erupted. But Rosenstein took his idea—to inject anhydrous ammonia into irrigation water—to Association Laboratory, Anaheim, Calif. The development job was passed on to Leavitt, then a chemist there. He's never been far from anhydrous ammonia since.

By 1934, lab and field tests had shown that direct use of ammonia, as provided in Shell's Nitroigation Service, was agronomically sound. (Nitroigation and Nitrojection are trademarks of Shell Chemical.) A parallel problem was to find a device that would meter anhydrous ammonia accurately at 3 to 4 pounds an hour. None could be found, so Shell worked out its own. By 1937, after some evolution, it had the basic metering device it uses today.

Nitroigation ammonia was ready for commercial use by the 1934 fertilizer season. Shell figured it would take 100,000 pounds of anhydrous ammonia that year. It took 400,000, and the method was off and running.

Demand Kept Growing

It still faced active opposition from people who thought anhydrous ammonia wasn't a good fertilizer. But demand kept growing. Leavitt was on the go constantly with the project in 1935, working mostly in California and Arizona. The next year he began spending more time at Association Laboratory (whose owner had died in 1935), still keeping in close touch with the ammonia development program. In 1939, he went to work for Shell full time.

Also in 1939, Leavitt got the direct injection idea. It happened while he was watching a machine lay underground telephone cable. He moved at once into the lab to see if soil would hold injected anhydrous ammonia. It would. Next, Leavitt and his associates beat out a crude injection shank at a local smithy. The shank idea looked sound, too, and the Cox nasal test came soon after. (Cox, by the way, was not unique. Leavitt recalls that Louis Proebsting, now a pomologist at the University of California, also wound up with his nose in a furrow.)

With the basic mechanics of direct injection more or less under control, Leavitt began checking the agronomic angles. Much of the lab work took place in the Fruit Growers Laboratory at Santa Paula. Then came field work on row crops all over the state. Besides agronomic studies, field tests involved further work on ammonia placement. Chief problem was to get it close enough to the roots to be available, but not close enough to burn.

Wartime shortages slowed the development of Nitrojection Service a



F. Haven Leavitt

Born 1903, Garfield, Wash. Pomona College, B.A. in 1926. Field man, Association Laboratory, Anaheim, Calif., 1926-27; chemist, 1927-37; managing director, 1937-39. Agricultural technologist, Shell Chemical Corp., 1939-42; senior agricultural technologist, 1942-56; Product Application, Agricultural Research Division, Shell Development Co., 1956 to date.

little, but full scale field work started in 1943. Commercial sales began the next year. In 1945, Leavitt started development work in Washington. Today, Shell's distribution system covers Arizona, California, Idaho, Oregon, Washington, and northwest Mexico. Altogether, direct injection of anhydrous ammonia is now practiced in 43 states.

In Good Company

Haven Leavitt grew up on a farm near Ontario, Calif., a propitious neighborhood for the development of agricultural leaders. Two of his boyhood friends were also to become well known in farm circles. One was Leo Gardner (AG AND FOOD, March, page 233) of Calspray, the other J. Earl Coke, formerly Under-Secretary of Agriculture, now a vice president of the Bank of America.

Last fall, Leavitt transferred from Shell Chemical to Shell Development Co. At the latter's agricultural laboratory at Modesto, Calif., he is starting a basic research program in soils and plant nutrition. In the past, Development's program has included plant nutrition studies incidental to the work of other departments. Plans for the future, however, will lead to organization of a plant nutrition group to handle both basic research and practical field application problems.