CHEMISTRY

"Cold" Rubber for Tires

The superiority of this synthetic product to natural rubber has hastened the conversion of plants to make possible large-scale production.

➤ MAN-MADE "cold" rubber makes markedly superior tires and other products and surpasses the natural tree-grown rubber. It is now going into large-scale production in America's chemical rubber plants.

What is happening is a new chapter in creative chemistry. During the recent war scientists made rubber from petroleum. They made this nation independent of unavailable natural rubber and gave us the essential tires for military and civilian transport.

Now the famous war-time GR-S rubber is being surpassed by post-war development of low-temperature manufacture, new chemical catalysts, and superior carbon black for compounding.

The rather chilly temperature of 41 degrees Fahrenheit, just nine degrees above freezing, is being used in the major cold rubber production. The temperature at which standard GR-S rubber is made is 122 degrees Fahrenheit.

Plants Being Converted

Over half of the operating capacity of the government-owned synthetic rubber plants, 200,000 out of 376,000 tons per year, is now in the process of being converted to cold-rubber production through installation of the refrigerating equipment necessary. Present plants do not need to be changed except to install tanks, compressors and other machinery for working at the lower temperature necessary. Eight out of the nine operating plants (all but the Akron plant) are being converted.

Glowing reports of the superior qualities of cold rubber have hastened the rush to its production. Synthetic rubber is now at least as good as the natural product, and most reports credit the low-temperature sort with being 20% to 40% better in wear. It does not heat up when tires are run at high speed any more than the natural sort, which was a fault of the older synthetic tires.

You may be getting some of the new cold rubber in tires that you buy without knowing it because tires made from it are not being labeled or advertised as such due to the present small production. In about a year most of the tires made are expected to be made with cold rubber.

Butadiene and styrene, polymerized together, are used to make cold rubber just as these two chemicals are the basic materials of the standard GR-S rubber. In polymerization, big molecules are made out of little ones. One key to low-temperature rubber production is the new sort of catalyst. In rubber technology, catalyst means an oxidizing agent that promotes polymerization and is used up in the process.

In the older synthetic rubber manufacture, potassium persulfate was used as catalyst, while in the cold rubber process cumene hydroperoxide is used. This organic peroxide was worked out in the University of Minnesota laboratories under the direction of Dr. I. M. Kolthoff and is a key ingredient of the low-temperature process, making it possible to complete the chemical reaction in a reasonable time, despite temperature.

Soap of fatty acid or rosin types is used in any kind of synthetic rubber formula in relatively large quantity to emulsify the chemicals used. More soap is used than styrene, one of the two chemicals that constitute the rubber.

In compounding the synthetic rubber into vulcanized products, such as tires, a new kind of carbon black, finely divided carbon filler for the rubber, is contributing greatly to the quality and economy of the product. This HAF or furnace black, as it is called, is made from oil or enriched natural gas.

Since synthetic rubber is a government operation growing out of the war situation, its price is controlled and set by the Office of Rubber Reserve. At present it is 18 1/2 cents a pound which compares with the current 22 1/2 cents a pound for natural rubber which is controlled by the British monopoly. Synthetic cold rubber is therefore cheaper as well as better than the natural material.

Latex rubber used in cord tire dipping, adhesives, rubber foam, textile coating, etc. is also being made by the low-temperature process with development of high gum tensile strength.

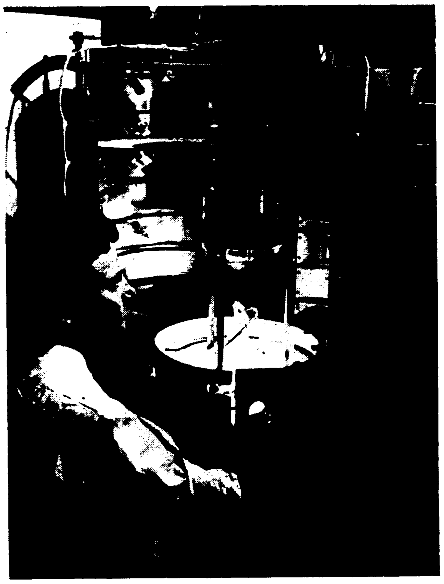
Because the synthetic rubber development is a government-industry undertaking, the cold rubber research and production is largely cooperative. Various rubber companies and research laboratories exchange information and work together.

The next step in cold rubber production will be to apply even lower temperature in hope of getting better and better quality rubber. One rubber company has made small scale polymerization at as low as 40 degrees Fahrenheit below zero, and some of this rubber has been tested in tires. Below-freezing processes are receiving fairly large scale, semi-commercial trials, with 14 degrees and 0 degrees as the temperatures being used. When subfreezing levels are encountered, anti-freeze must be used in the water used, just as in automobile radiators. This complicates the process. The lower temperatures also require more refrigeration.

Cold rubber promises to withstand better the arctic temperatures that trucks and other equipment must encounter in case of another war. Rubber made at 41 degrees also does not crack as easily as ordinary rubber.

Low-Temperature Rubber

Hints of the possibility of low-temperature rubber production antedate the government rubber program that began in 1940. It was early recognized that low-temperature polymerization would produce rubber of better quality, but the 122-degree temperature was adopted because the emergency was great and the standard process gave known results with the reaction running 14 hours. During the war the "speed-up" chemicals increasing the polymerization rates at low temperatures were developed, and German experience with low temperature rubber recipes became known. With the end of the war, the effort to improve the process could be resumed. The use of what is called the "redox" system, involving oxidizing ("catalysts") and reducing agents, was refined and ap-



500 TIMES BRIGHTER—The large electronic tube shown here is the first working model of the X-ray "telescope" which will brighten by 500 times the living image viewed by the doctor on the screen of the X-ray fluoroscope. Westinghouse scientist Dr. Richard L. Longini is shown closing the doors of a special electric furnace in which the tube will be baked and evacuated of air.

plied, with the practical results coming this year on a considerable scale.

Most of the rubber companies contributed to the development. The first pilot plant production of low temperature polymers was made by Phillips Petroleum Company in the late spring of 1946, while shortly after the middle of 1946 Goodyear produced a ton for experimental use. The U. S. Rubber Company made the first plant scale run of low temperature rubber experimentally in the summer of 1947, while the Copolymer Corporation at Baton Rouge, La., after pilot plant operation the same year, converted half of its 30,000 ton capacity to 41 degree rubber early this year.

Plants now being converted to cold rubber production are: Copolymer Corp., at Baton Rouge, La., U. S. Rubber Co. at Naugatuck, Conn. and Borger, Tex., Goodyear Synthetic Corp. at Houston, Tex., and Los Angeles, Calif., Firestone Tire and Rubber Co., at Lake Charles, La., B. F. Goodrich at Port Neches, Tex., General Tire and Rubber Co., at Baytown, Tex.

Science News Letter, December 4, 1948

ASTRONOMY

Palomar Giant Incomplete

➤ THE 200-INCH telescope atop Palomar Mountain is about to begin to probe the universe.

Nothing but test pictures have been taken to date with this giant telescope, dedicated six months ago (June 3).

When completed, the telescope will penetrate twice as far into space as previously possible. It will make available eight times the volume of space astronomers now have at their disposal.

But testing and adjusting is a time-consuming job, reports Dr. Ira S. Bowen, director of both Mount Wilson and Palomar Observatories. Progress is "good," and no slower than anticipated.

Latest estimates indicate that the Hale telescope, to be operated jointly by California Institute of Technology and Mount Wilson Observatory of the Carnegie Institution of Washington, will actually go into operation late next spring.

Latest score on the world's largest telescope shows:

Final adjustments must be made on the 200-inch mirror.

Two of the telescope's seven mirrors have yet to be finished, installed and adjusted.

Coude spectrograph is still incomplete.

Ross correcting lens remains to be installed at the telescope's prime focus.

The telescope is a reflector, not a refractor. Thus it is made of mirrors rather than lenses. The 200-inch mirror, of course, is the largest of these. It weighs 14 3/4 tons.

Minor modifications were made on the support system for the telescope this summer, and new adjustments are now being completed. More tests are being run to check the mirror.

Three respects in which this telescope will surpass all other telescopes are:

Dispersion, of importance in the study of the relative abundance of elements in the universe.

Resolving power, of value in deciding whether there are canals on the planet Mars, thus indicating whether or not intelligent beings exist there.

Space penetration, helpful in deciding whether the universe is expanding, as many astronomers believe.

When finally completed, the telescope will catch on photographic plates light that started its journey to the earth a billion years ago.

Science News Letter, December 4, 1948

ENGINEERING

Trestle-Tube Proposed

➤ A UNIQUE combination of bridge, earth-fill and subway tube across San Francisco Bay, to handle increasing highway traffic now beginning to overtax the San Francisco-Oakland Bay Bridge, is suggested in an official report to the State of California.

The tube, considerably over a mile in length, would extend from the end of a bridge on one side to an extended earth-fill on the other, dipping between into the floor of the bay. It is one of two plans recommended in the report by Ralph A. Tudor, chief engineer of the California Division of San Francisco Bay Toll Crossings. The other is a twin bridge parallel to the present structure.

The trestle-tube combination presents difficult engineering and geological problems which both engineers and geologists believe can be solved. The soft mud at the bottom of the channel is one of the principal of these. The proposed solution is to dredge it out to a hard base, and to put in its place a foundation of sand.

The total crossing would be some six and one-half miles in length. The trestle bridge would be about one mile long. The proposed tube would be approximately 6,000 feet in length, and an earth-fill would occupy the rest of the crossing length. Three parallel tubes are proposed. Each would be 37 feet in diameter and constructed of reinforced concrete. They would be constructed near shore in three sections with bulkheads, and floated to position. Giant cranes would lower them to the prepared bed of sand, where the sections would be joined together.

Geological studies of the channel mud bed have already been made under the direction of the supervising geologist, Parker D. Trask, of the San Francisco Bay Toll Crossings. He states that the depth of mud to be removed runs up to 50 feet. Suitable sand for replacement has been located about five miles away.

The sloping tubes on both ends would be supported and protected by sand islands extending well above the high-water line. The islands themselves would be protected from current and wave action by heavy riprap. This combination scheme leaves a clear unobstructed channel for shipping. A tube for the entire crossing distance is economically impracticable.

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AGRICULTURE

"Turkish" Tobaccos Now Grown in United States

➤ THE UNITED STATES may soon be able to declare independence again—this time from Turkey. Turkish-type tobaccos, noted for their high aroma volume, are necessary ingredients of all quality cigarettes.

Spurred by wartime shortages, plant scientists at Duke University under the leadership of Dr. Frederick R. Darkis have successfully grown high-aroma tobaccos in cooperation with the agricultural experiment stations of Virginia and the two Carolinas. The new American "Turkish" tobaccos are also low in nicotine.

Science News Letter, December 4, 1948

METEOROLOGY

Sun and Moon Cause Tides in Atmosphere

➤ UNOBSERVED by human senses, two daily tides sweep through the ocean of air at the bottom of which we live. Their existence and causes were discussed by a noted Norwegian meteorologist, Dr. J. Bjerknes of the Geophysical Institute of Bergen, before the meeting of the National Academy of Sciences in Berkeley, Calif.

One of the tides is a response to the pull of the moon, the other to that of the sun, with the solar air tide much the higher. Its crests come at 10 a.m. and 10 p.m. at sea level; but there is a "tilt" in their height, Dr. Bjerknes stated, so that on a mountain 17,000 feet high the crests come at noon and midnight. He presented results of calculations tending to show that the amplitude of the solar air tide is strengthened by the heating effect of the sun.

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