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SCIENTISTS AND SCIENTIFIC ORGANIZATIONS OF THE USSR

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FOREWORD

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SCIENTISTS AND SCIENTIFIC ORGANIZATIONS OF THE USSR

(Selected Translations)

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Scientific and Technical Conference on the Coordination of Scientific Research and Experimental-Design Activities in the Rubber Industry

(by V. P. Khabarov and I. A. Sheftel')

On 4-7 April 1961 the NIIRP (Nauchno-issledovatel'skiy institut rezinovoy promyshlennosti -- Scientific Research Institute of the Rubber Industry) sponsored a scientific and technical conference on coordinating the programs of scientific research and experimental-design activities of NIIRP, NIIR (Nauchno-issledovatel'skiy institut rezinovykh i lateksnykh izdeliy -- Scientific Research Institute of Rubber and Latex Goods); Rezinoprojekt (Gosudarstvennyy institut po proyektirovaniyu predpriyatiy rezinovoy promyshlennosti -- State Institute for the Planning and Design of the Rubber Industry), and the technological-design departments and departments of automation and mechanization of plants producing RTI (rezinovyye tekhnicheskiye izdeliya -- rubber products for industrial use) as well as rubber goods for general consumption.

The conference was organized by the Tire and RTI Administration, the State Committee of the Council of Ministers USSR on Chemistry, and NIIRP.

Opening the conference, Ye. M. Rabkin, chief engineer of the Tire and RTI Administration, State Committee on Chemistry, remarked that the annual scientific and technical conferences on the coordination of the scientific research and experimental-design programs of institutes and plants of the rubber industry are enabling industrial personnel to take advantage of the achievements of individual concerns, to exchange experimental information, and to coordinate planning for the current year.

Ye. M. Rabkin also gave a brief outline of the state of the RTI and rubber footwear industry during 1960. Gross production of the RTI industry went up by 23.5%, the production of rubber footwear by 13.5% (against 21.8% and 8% as predicted in the program).

The program was exceeded mainly as the result of stepping up and expanding existing plants, automation and mechanization of technological processes, and the installment of constant-flow lines. The production of RTI and their quality were greatly improved, a number of new hard rubbers and ingredients were utilized, and new products were developed.

So far, however, the rise in production of RTI lags behind the overall level of the machinery industry. Consumer requirements for RTI are not being fully met.

In 1961-1962, problems that lay before the industry of RTI and rubber for general consumption must be worked out.

A report on the main results of scientific research at NIIRP during 1960 and a thematic program of scientific research, experimentation, and design to be carried out in 1961 was made by S. V. Budrov, assistant

scientific director for the Institute.

The activity of the Institute was directed toward solving the problems posed by the Party and the government in the decisions of the May (1958) and July (1960) plenary sessions of the Central Committee CPSU on the acceleration of technological progress.

A number of papers of great national economic significance were compiled in conjunction with the Central Industrial Laboratories and technological-design departments of the Kauchuk Plant, the Leningrad, Kazan, Sverdlovsk, Yaroslav, and other RTI plants.

Of the more important studies carried out by the Institute in 1960, the author noted the development of parameters for the layout of constant-flow lines for the production of pressure hoses with a coiled construction; the design of automatic pouring equipment for molded products; automatic machinery for the production of articles with no casting seams, high-production line for the manufacture of castings and closed press forms; the design of an assembly for freeing molded products by chilling; an automatic line for the brass plating of fittings; research and study on the properties of and recommendations for new types of rubbers and ingredients for rubber mixtures; the development of an assortment of fabrics, fibers, and cording from chemical fibers and impregnated compositions.

A great many papers were directed toward the creation of new RTI and the development of a technology for their manufacture. For instance, manuals were written up for the production of conveyor belts from capron fabric; recommendations were given for the production of cold-resistant conveyor belts from anidé fabric; in conjunction with the Kursk RTI plant a technology was developed for the manufacture of reinforced belts 2400 mm wide; a design was worked out and prototypes produced for heat-resistant conveyor belts with an asbestos heat-insulating layer; designs were developed and experimental specimens produced of belts for belt-chain conveyors making a turn of 90° in the plane with a crimp; designs were developed for braided hoses with application of chemical fibers in place of pulp and metal braiding; and a design and production technology were worked out for two-channel hoses for cushioned hammers. New glues, self-vulcanizing materials, and coatings for rubberization were also invented.

Of the theoretical and exploratory studies conducted by the Institute in 1960, the author noted investigations of the strength properties of rubbers at high temperatures and in aggressive media, an investigation of the plasticity of rubber mixtures at high temperatures, an investigation of the nature of rubber contraction during vulcanization, a calculation of the contraction of rubber articles with simple configurations. The Institute developed and put into operation new methods for the investigation and testing of rubbers, elastics, and RTI; instruments for determining hardness from a scheme involving loading, a time indicator, and a specimen with a vibration node; a procedure for determining the hardness of rubbers after swelling over a wide range of temperatures.

In 1960 the Institute completed work for State Standards on V-belt ventilating systems with a lifetime up to 40 thousand km; rubber-fabric

steam hoses with no spiral construction and with a composition of increased steam resistance; rubber packing rings of circular cross section; packing for axles; spring-fitted rubber cups, etc.

In 1960 the Institute introduced into industry a number of new products: flat-toothed belts with a metal cord base; drilling hoses with an improved braided construction and with a period of service twice as great as those now available; hoses with a new construction, including a double jacket; steam hoses with a period of service twice as long as previous hoses; packing rings for asbestos-cement tubes; a direct duct for conveyor belt coating; new rubber mixtures with increased heat resistance and resistance to aggressive media; self-vulcanizing glues, etc. The Institute introduced into industry a new technology for the production of tube-drilling collar bearings, the load-carrying capacity of which is three times greater than the regular types. The nominal annual savings from the studies put into use in industry amounted to 24 million rubles in 1960.

Considerable work was done to keep factories informed on the activities of the Institute and the advances of Soviet and foreign science and engineering.

A. S. Novikov (NIIRP) discussed the modern trends in Soviet and foreign industry in the development, testing, and application of new polymers, as well as ingredients and rubbers using them as a base.

V. K. Smirnov (Kauchuk Plant), A. L. Zenkevich (Krasnyy Rezinshchik Plant), P. I. Tikhomirov (Leningrad RTI Plant), V. S. Zverev (Sverdlovsk RTI Plant), T. N. Titarenko (Kursk RTI Plant), A. G. Yakubov (Kazan RTI Plant), and M. S. Kogan (Yaroslav RTI Plant) reported on the results of their respective central industrial laboratories and technological-design departments with respect to the utilization of new kinds of raw materials and new types of products, over-all mechanization and automation of production, mechanization of difficult hand-operated processes, introduction of advances and refinements of the existing technology, new methods for inspection, modernization of equipment, increasing worker efficiency, and cutting production costs.

Thus, at the Krasnyy Rezinshchik Plant a new shop for the production of molded and nonmolded items has been put into operation; a semiautomatic process for the manufacture of glues has been developed and put into operation; a section for the manufacture of polychlorvinyl gloves has been created; the working features of a propelling conveyor connecting the main shops, raw material warehouses, and final production, have been developed.

At the Leningrad RTI Plant a weighted chain conveyor with a simple construction has been introduced; the production of molded rubber toys and tennis balls has been completely mechanized and made automatic; in the production of hoses with a laminar construction machines with mechanized carriages are being used, along with pneumatically removed shoes and mechanical unreeling of wire. The plant is incorporating new rubber products (conveyor belts with fiber reinforcement, rubber-metal connections, shock absorbers, etc.).

At the Sverdlovsk RTI Plant the Mars-200 electronic machine has been installed and put into operation for the automation of temperature regulation and control in vulcanization presses; the production of large-diameter valves; in the belt plant a mechanized line has been put into operation for the assembly of ventilator belts; in the hose plant the cutting of sections of metal braid on the contact welding apparatus has been introduced; technological processes have been developed and put into operation for the production of conveyor belts for cable-belt conveyor systems in the ore concentrating and gold mining industries.

The Yaroslavl RTI Plant has mechanized the cutting of circular rings of various diameters, and introduced semiautomatic processing of products with conical shapes, etc.

At the Kauchuk Plant they have put into operation a press with removable plates, a four-stage press with increased output, and automatic calibration meters using drum graphs. The plants for making forms and metal-braided hoses are being reconstructed and presses with increased pressure, improving the quality of the products are being installed.

The Kursk RTI Plant has developed and produced new parts for various assemblies, including those for agriculture, medical facilities, etc.

The Krasnyy Treugol'nik and Krasnyy Bogatyr' Plants, in conjunction with NIIR, developed a number of new technological processes, products, methods of mechanization and automation, making it possible to improve the quality of the products, partially relieve the use of manual labor, improve working conditions and increase labor productivity, and lower the cost of production.

The Institute developed a mechanized production line for overshoe forms, the utilization of which will increase labor productivity by 85% and cut production costs of glued overshoes. The working area required is cut in half.

Considerable work was done by the NIIR on the study and recommendation of new forms of rubbers and ingredients for the rubber footwear industry and for rubber products for general consumption.

As a result of the study of the existing organizations for the control and allocation of workers on control operations at two rubber footwear plants and at two RTI plants, the Institute worked out recommendations for the improvement of inspection of raw materials and the finished products, the introduction of which will make it possible to cut down considerably on the number of workers occupied with control operations.

Considerable attention was devoted to the design, formula, and manufacture of rubber goods for agriculture. Together with the All-Union Institute of Experimental Agriculture and the Kursk RTI Plant, the Institute perfected a rubber recipe and the design of parts for milking equipment. For the food industry the intricate parts for milk separators, wine-making machinery, and machinery for the processing of fats were developed. Together with the Institute of the Ministry of Public Health and other institutions, RTI and rubber footwear factories, they developed rubber parts for artificial blood circulation machines and artificial

kidneys, parts from antistatic rubber for anesthesia, and a number of products for better medical diagnosis.

Considerable work is being done in the area of technical information.

D. L. Fedyukin (NIIR) reported on new methods and instruments for the physical-mechanical testing of rubber and rubber goods developed by NIIR (in some cases in cooperation with the Metallist Plant). An instrument was developed for determining the quality of corrugated rubbers, and the coefficient of linear expansion of monolithic rubbers; an instrument for determining the kinetics and optimum conditions for the vulcanization of rubber mixtures; an instrument and method for evaluating the wearability of footsole rubber; an instrument and method for determining the degree of slippage of footsoles with various configurations; an apparatus and procedure for testing corrugated rubber for frost resistance; an instrument for testing corrugated rubber for stiffness; a procedure for determining the tendency of rubber mixtures toward scorching, plus others.

The conference approved the program and direction of scientific research and experimental-design activities of the plants and institutes considered in the sections and recommended their fulfillment in 1961.

The conference deemed it necessary to request the Gosplan of the Council of Ministers USSR, the State Committee of the Council of Ministers USSR on Automation and Machinery, the State Committee of the Council of Ministers USSR on Chemistry, the All-Union Sovnarkhoz and Ukrainian Sovnarkhoz to amplify the design and mechanical bases of the newly developed types of equipment ensuring the mechanization and automation of technological processes. Toward this end, it will be required to set up branch design offices for the various individual kinds of production in the leading factories of the rubber industry, to provide in the program of the corresponding central boards of the design offices for the layout and design of equipment for the RTI industry and rubber footwear industry, and to appoint specialized plants for the manufacture of nonstandard equipment and constant-flow lines for the rubber industry, as well as facilities for the production of specially shaped shoes.

The conference recognized the suitability of holding annual conferences on the programs of RTI and rubber footwear plants in specialized areas.

Second All-Union Conference of Chemical Analysts from
the Rubber Industry

(by V. N. Provorov)

From 16 to 19 January of this year a conference was held under the auspices of the organization committee of chemical analysts of the rubber industry and NIIR (Nauchno-issledovatel'skiy institut rezinovykh i lateksnykh izdeliy -- Scientific Research Institute of Rubber and Latex Goods), at the site of the latter. The conference was devoted to methods of qualitative and quantitative assessment of vulcanization accelerants and the results of studies conducted by scientific research institutes and central industrial laboratories during 1960 in the various methods of production analysis and control.

Taking part in the conference were representatives of tire plants, plants for RTI (Rezynovyye Tekhnicheskiye Izdeliya -- rubber products for industrial use) and rubber footwear, the Sangigiyena Plant, and reclamation, asbestos-technological, and scientific research institutes, including NIISHP (Nauchno-issledovatel'skiy institut shinnoy promyshlennosti -- Scientific Research Institute of the Tire Industry), NIIRP (Nauchno-issledovatel'skiy institut rezinovoy promyshlennosti -- Scientific Research Institute of the Rubber Industry), VNIISK (Vsesoyuznyy nauchno-issledovatel'skiy institut sinteticheskogo kauchuka -- All-Union Scientific Research Institute of Synthetic Rubber), VNIATI (Vsesoyuznyy nauchno-issledovatel'skiy institut asbotekhnicheskikh izdeliy -- All-Union Scientific Research Institute of Asbestos Industrial Products), NIIOPiK (Nauchno-issledovatel'skiy institut organicheskikh poluproduktov i krasiteley -- Scientific Research Institute of Organic Semiproducts and Dyes), VNIMI (Vsesoyuznyy nauchno-issledovatel'skiy institut molochnoy promyshlennosti -- All-Union Scientific Research Institute of the Dairy Industry), the Yaroslav and Dnepropetrovsk Chemical Engineering Institutes, and others.

Opening the conference, V. N. Provorov, chairman of the organization committee of chemical analysis of the rubber industry, stated that the present conference was intended to summarize the results of studies at scientific research institutes and central industrial laboratories in the development of methods of qualitative and quantitative assessment of accelerants and to look at the lines of further working in this direction. During the last 30 years, both in the Soviet Union and abroad, these methods have been insufficiently developed, as a result of which there are not at the present time reliable and satisfactory methods for the assessment of accelerants.

A survey report on the quantitative analysis of accelerants was presented by G. P. Shervachev (NIIRP). For the control of the content of accelerants in pastes and raw mixtures, the Moscow Tire Factory and

NIIRP developed and applied a polarographic method, enabling them to perform an analysis in 30-40 minutes. It remains for them to perfect the procedure for analysis of carbon-containing mixtures.

For the approximate quantitative analysis of accelerants in vulcanized rubbers a method has been proposed abroad employing paper chromatography, which has to be processed in every detail, both in the extraction of information as a whole and in discriminatory chromatography.

Ye. P. Taraday (NIIR) presented a survey paper on methods of qualitative analysis of accelerants, evaluating the existing methods and recommending individual qualitative reactions for accelerants. It was noted in the report that for sulfenamide accelerants there are no reliable qualitative reactions in existence.

M. S. Fel'dshtein (NIIShP) considered the action of a number of derivatives of 2-mercaptobenzothiazole (sulfenamide and disulfide compounds) as vulcanization accelerants. The author quoted data which pointed to a radical mechanism for the action of these accelerants and remarked on the peculiarities of the kinetics of vulcanization as a function of chemical structure of the accelerants. In concluding the report the effect of binary systems of vulcanization accelerants was considered. It was shown that mutual activation in a binary system of accelerants does not lead to the formation of salt compounds and eutectic molecular mixtures, but instead to the chemical interaction of the accelerants which proceeds through an intermediate complex stage capable of decomposition into free radicals which interact with rubber and sulfur.

N. N. Kulagin (VNIMI) reported on a method developed for the qualitative analysis of thiuram in milk and the action of milk on rubber products.

G. A. Blokh (Dnepropetrovsk Chemical Engineering Institute) reported on "Isotope Exchange and Mechanism of the Action of Rubber Vulcanization Accelerants." It was found that in the vulcanization of rubber there is an exchange of the sulfur atoms constituting the structure of the accelerants and forming a polysulfide bond with the rubber and elementary free sulfur. Data on isotope exchange show that the more active the accelerant the lower will be the temperature and the higher the rate at which exchange of sulfur atoms takes place. The report contains composite schemes for the mechanism of vulcanization acceleration by means of mercaptobenzothiazoletetramethylthiuramdisulfide, wherein it is shown that the acceleration of vulcanization is the result of both exchange and free-radical reactions taking place in rubber.

A. V. Kalacheva (Moscow Tire Plant) discussed a procedure developed at the factory in 1954 for the polarographic assessment of accelerants in pastes. The feasibility of quantitative selective analysis of accelerants and sulfur in pure components was demonstrated.

V. S. Glavina (Yaroslav RTI and Dnepropetrovsk Chemical Engineering Institute) reported on a study of adsorption of vulcanization accelerants by ingredients of rubber mixtures with a synthetic and natural rubber base in the process of mixing and vulcanization. The authors found that even in the mixing stage the accelerant is present in both the bound and free

states, as well as in the form of interaction products. Not only the free accelerant but that which is adsorption bonded with a carbon structure contribute to the vulcanization process. It seems that complex chemical reactions occur right on the carbon surface, leading to the formation of a vulcanized three-dimensional structure with the necessary combination of physical, mechanical, and chemical properties.

Reports by the heads of the analytic sections of the central industrial laboratories of rubber plants were also heard at the conference, presenting the results of studies on the testing and application of various techniques for the assessment of accelerants in rubbers.

F. Ya. Chernomorskaya (Sangigiyena Plant) described the work being done to establish the sensitivity of qualitative reactions in the analysis of accelerants in mixtures and vulcanized rubbers in application to the products turned out by the factory.

E. A. Melamed (Krasnyy Rezinshchik Plant) pointed out some of the shortcomings in certain qualitative reactions and reported that excellent results have been obtained in the quantitative assessment of thiuram by polarographic techniques for the raw materials of low-content and high-content mixtures.

Ts. I. Dobroborskaya (Leningrad RTI Plant) discussed some of the disadvantages encountered in the qualitative analysis of accelerants. Thiuram is quantitatively analyzed without any major difficulties in raw mixtures by colorimetric techniques.

L. Ya. Glodina (Voronezh Tire Plant) reported on the results of studies on the quantitative analysis of Captax by ammetric titration; in pure rubber mixtures the Captax assessment is 97%, in impure rubbers from 50 to 65%. A method was developed for the quantitative analysis of thiuram in raw rubber mixtures by means of copper sulfate using a type FEK-M photoelectric apparatus [cell?].

Ye. Ye. Slashcheva (Yaroslav Tire Plant) discussed some of the shortcomings of qualitative reactions used to assess accelerants. It was noted that the chromatographic method is used in the analysis of imported rubbers; quantitative methods of analysis of accelerants are not employed.

N. A. Isakova (VNIISK) pointed out that the major task of the chemical analysts is to issue recommendations for the analysis of SKD and SKI-3 synthetic rubbers. Work is being done on the utilization and refinement of methods for the microanalysis of fluoro-organic compounds, and on the analysis of silicone rubbers and rubber mixtures using these as a base for metal content. Moreover, a method has been developed for analyzing nickel in rosin soap and rubbers.

A. S. Pomogaybo (NIIRP) reported on the development of methods for the analysis of silicon in polymers and rubbers containing fluorine, the polarographic assessment of lead and nickel in rubbers and ingredients, and the analysis of total sulfur and fluorine with the application of high-frequency titration.

V. N. Provorov (NIIR) stated that by changing the intensity of luminescence of luminous rubbers with a natural rubber base in the vulcanization process, the free sulfur can be quantitatively controlled.

The tire testing instrument IShP-2 (NIIShP) was recommended for controlling the drying of latex films without destroying them. A method was developed whereby a high-frequency spark discharge is used to detect flaws in the films. The author recommended an accelerated procedure for the analysis of moisture from the dew point in shaped rubber pieces.

I. P. Martyukhina (NIIShP) reported on the analysis of lithium by flame photometry, aluminum, nickel and titanium in vulcanized and natural rubbers by spectral techniques, and traces of nickel and copper in rubbers by polarographic methods.

F. P. Smolkin (VNIIATI) reported on new accelerated methods for the assessment of iron, zinc, magnesium, and calcium by trilonometric techniques, copper and zinc by means of dithizone and magnetic iron oxide on the FMP ferrometer.

N. M. Vital'skaya (Yaroslavskiy Engineering Institute) made a report on the "Analysis of Soot in Rubber Mixtures with the Application of Chromatographic and Combined Methods of Measurement." A new method of ashing rubbers, making it possible to obtain proper results, was developed. A chromatographic method was proposed for the discrimination of cations (calcium, magnesium, zinc, iron, and aluminum) with EDE-10P anionite, followed by a quantitative combined analysis of metal content. The use of these methods includes at the same time the precipitation of the metals.

The heads of the analytic sections of the central industrial laboratories of rubber factories pointed out that the greater part of the effort for 1960 was directed toward the introduction and utilization of new methods of analysis.

At the Kauchuk, Krasnyy Treugol'nik, Krasnyy Rezinshchik, Moscow Tire, Yaroslav Tire, Kuybyshev Tire, and other plants, in addition to the current analyses, new methods of research are constantly being developed.

The conference adopted a resolution recommending exploratory research for new methods of qualitative and quantitative assessment of accelerants in rubbers.

It was noted that an insufficient amount of work is being done to establish accelerated methods of analysis; the introduction of new methods of analysis is delayed by a lack of sufficient instrumentation.

A new organization committee was approved. It was resolved to hold the next conference on methods of assessment of accelerants and other ingredients in 1964.

- END -