SOV/142-2-1-19/22

The Application of HF Heating in Rubber Manufacturing Processes

preliminary heating of rubber, rubber-metal and rubber-fabric products prior to shaping and vulcanizing; drying of sponge products; etc. Further, the Institute works on the volcanization of sponges and tires in metal molds, etc. The introduction of the dielectric heating method is delayed by the completely inadequate output of high frequency generators for dielectric heating. In addition, the development of measuring instruments with small input capacitances is necessary, since the existing models have too high input capacitances which detune the HF generators, for example, the tube voltmeter VKS-7b. The application of high frequency currents requires additional investigations, since this method leads to a reduction of the production costs and improves the quality of the products. Finally, the authors point out that the number of high frequency heating specialists must be increased.

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15(9) SOV/142-2-1-19/22

AUTHORS: Malkina, Kh.E. and Pukhov, A.P., Candidates of Technical Sciences

TITLE: The Application of HF Heating in Rubber Manufacturing Processes (O primenenii v. ch. nagreva v tekhnologii rezinovogo proizvodstva)

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy - radiotekhnika, 1959, Vol 2, Nr 1, pp 118-119 (USSR)

ABSTRACT: In a letter to the editorial board of the periodical "Izvestiya vysshikh uchebnykh zavedeniy - radiotekhnika" the authors state that high frequency heating in the electric field of a capacitor is especially suitable for the rubber industry. Thereby, they refer to the paper of A.V. Netushil, published in "Radiotekhnika", Vol 1, Nr 1, p 25. In this connection, the authors list the technological processes which are developed with the application of high frequency heating by the NII shinnoy promyshlennosti (Scientific Research Institute of the Tire Industry): decrystallization of natural rubber;

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S/081/60/000/022/013/016
A005/A001

Drying of Latex Sponge by Applying High Frequency Currents

intense drying, the sponge temperature increases monotonously. The higher the accuracy in washing off of the sponge, the lower is the value of tg δ, the lower the probability of its overheating during the drying process. The layout of a pilot unit for sponge drying is described. The optimum conditions for sponge drying and the economical substantiation of the expediency of drying the sponges by h. f.-currents are presented.

I. Pil'menshteyn

Translator's note: This is the full translation of the original Russian abstract.

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S/081/60/000/022/013/016
A005/A001

Drying of Latex Sponge by Applying High Frequency Currents

0.34 to 0.036, and the dielectric constant (ε) decreases from 3.95 to 1.54. At the decrease of tg δ and ε, their values remain in that range in which the sponge is heated further effectively. This change of the electric characteristics favorably affects the quality of the sponge, because it does not allow the overheating of the sponge. In the general case, the electric sponge properties are dependent on the composition of the latex mixture, the porosity of the sponge, and the carefulness of washing off. The better the washing off of the sponge, the higher is the drying process rate. The intensification of the sponge drying by increasing the frequency of the current and the intensity of the electric field is possible up to a definite limit which is due to the decrease in the quality of the sponge at very quick drying. In the drying of a test piece of 40 mm thickness for 6 minutes the rate increases during the first minute, then it reaches a maximum, and after 3 minutes the drying rate is low, and the piece is dried in the main. During the remaining 3 minutes, the moisture content is brought to the ultimate value. The greater the thickness of the test piece, the lower is the drying rate. The temperature of the sponge during the drying process is not constant. If the drying intensity is low, the functional curve of the sponge temperature versus the drying duration passes through a maximum, not exceeding a definite allowable value. At

S/081/60/000/022/013/014
A005/A001

Translation from: Referativnyy zhurnal, Khimiya, 1960, No. 22, p. 516 # 90724

AUTHORS: Korotkova, A. A., Malkina, Kh. E., Pukhov, A. P., Fomina, L. S

TITLE: Drying of Latex Sponge by Applying High Frequency Currents

PERIODICAL: Tr. N.-i. in-ta rezin. i lateksn. izdeliy, 1959, sb. 2, pp. 77-92

TEXT: The authors studied the drying process of the latex sponge by h.f.-currents. The unit for drying the ware consisted of a h.f.-generator, heating electrodes, and measuring instruments. The h.f.-generator with the oscillation power of 1.5 kw was made up with two tubes of the ГК-3000 (GK-3000)-type. The heating electrodes are plates of sheet aluminum of 300 x 200 x 3 mm in size. The test pieces with parallelepiped shape of 150 x 100 x 40 mm in size were heated in the electrical h.f.-field of the planeparallel heating electrodes which had neither thermal nor electric contact with the test pieces. In this way, the removal of the water vapors was promoted which were liberated from the material in the drying process. During the drying process of the sponge at 80°C, its moisture decreases from 55 to 1.2%, the tangent of the dielectric loss angle ($tg\,\delta$) decreases from

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electrode is formed by a conveyor belt constructed from aluminium angle sections. The upper electrodes are aluminium plates which can be raised or lowered in hydraulic rams and which are brought close to but not in electrical contact with the tyres. Tyres are preheated in this plant after moulding, before vulcanisation, for 4 1/2 minutes at 8 kV and 17 megacycles. Power consumption per tyre is 3.5 to 4 kWh. The use of HF heating is not satifactory with tyres containing electrically conductive material such as carbon black, as the presence of conductive particles on the surface of the tyre leads to instability in the heating process through short-circuiting.
There are 8 figures and 10 tables.

ASSOCIATIONS: Moskovskiy shinnyy zavod (Moscow Tyre Factory)
Nauchno-issledovatel'skiy institut shinnoy promyshlennosti (Research Institute for the Tyre Industry)

tyre after vulcanisation. Rig tests on tyres so treated show double life, on average, and great reduction in scatter.

Results of field tests on three different classes of road surface are shown in Table 7, and confirm that tyres subjected to HF heat treatment before moulding and vulcanisation have substantially better life than standard tyres, particularly on bad surfaces.

HF heating shortens vulcanising time, particularly as the curing bag is brought up to its operating temperature during preheating. Vulcanising time can be reduced from 110 minutes at 145 °C (with standard vulcanisation) to 76 minutes at 160 °C with HF preheating, with general improvement in bond strength between layers as is evidenced in Table 9. Table 10 compares rig test lives of tyres with standard vulcanisation for 110 minutes at 145 °C with lives of tyres vulcanised for shorter times at higher temperatures following HF heat treatment. Vulcanisation for 80 minutes at 155 °C following HF heating gave more than double life.

Card4/5 Figures 7 and 8 show plant for preheating tyres. The lower assuming that the specific heats of the different rubber mixes are similar, the carcass and breaker rubber will attain higher temperatures. This is a desirable state of affairs and is one of the advantages of HF heating as compared with preheating by hot air.

Heat treatment may also be applied to moulded tyres before vulcanisation. In this case, temperature distributions are as shown in Table 4 and Figure 6. (Figures 5 and 6 show temperature distributions with HF heating and with hot-air heating.) Where a moulded tyre is preheated before vulcanisation, the scatter on life test is reduced if the tyre is subsequently cooled before vulcanisation. The curing bag attains a high temperature on account of water in the composition of the lubricating medium used on the surface of the bag. The authors suggest that the best effects of heat treatment are obtained with two-stage treatment before moulding and before vulcanisation; comparisons of rig test lives with HF heating at different stages of manufacture are given in Table 6.

Card3/5 Heat treatment of vulcanised tyres is also beneficial, having an annealing effect upon stresses remaining in the

the tread mix is much less plasticised at this temperature. Equilibrium between the solubility of sulphur and the content of sulphur in the mix occurs at about these temperatures. Experiment shows that preheating to this temperature gives least relaxation and greatest improvement in tyre quality. Higher temperatures can lead to porosity and pre-vulcanisation. Average breaker rubber mix is subject to pore formation at 73 °C and in natural rubber tyres the breaker mix is the most sensitive to pre-vulcanisation. Tyres may remain in a pre-heated condition for 40 - 50 min if their temperature does not exceed 70 - 80 °C.

Different parts of a tyre have different electrical characteristics which leads to unequal temperature distribution in a high-frequency heating field. The simplest and most effective arrangement for HF heating is between parallel electrodes, as shown in Figure 2. Temperature differences in an unmoulded synthetic rubber tyre preheated for 8 to 10 minutes in an HF field at 8 kV and 11 megacycles are shown in Table 2 and Figure 5. Dielectric constant times loss angle gives a lower loss factor for the tread part of the tyre than the internal parts, so,

SOV/138-58-11-4/14

AUTHORS: Goranskiy, V.V., Malkina, Kh.E. and Pukhov, A.P.

TITLE: Preheating Tyre Casings Before Moulding and Vulcanisation (Nagrev pokryshek pered formovaniyem i vulkanizatsiyey)

PERIODICAL: Kauchuk i Rezina, 1958, Nr 11, pp 11 - 17 (USSR)

ABSTRACT: Preheating improves the strength of bond between the parts of the tyre by increasing the interaction between rubber mixes at the interfaces between layers, as a result of higher plasticity and dispersibility. It gives increased adhesiveness at these surfaces through diffusion of sulphur into the rubber mass away from the surfaces and reduction of stresses in the casing at different stages of the manufacturing processes.
With preheating before moulding or before vulcanisation, tyres show increased lives on rig test and considerable decrease in scatter between greatest and least lives on test. Best results are obtained where tyres have been preheated by high-frequency current and are subsequently pressed and moulded without intermediate cooling, as shown in Table 1. Figure 1 shows the plasticity of different mixes used in the tyre against temperature. A sufficient degree of plasticity for satisfactory moulding is attained in the breaker and carcass mixes at 60 - 70 °C, whereas

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SOV/138-58-7-6/19

Method of Drying and Vulcanising Latex Products

60 - 130 °C in four stages and a vulcanising time of 25 minutes at 150 °C. The moisture content at the time of transition from drying regime to vulcanising regime should not exceed 4-5%.

There are 7 figures and 3 tables.

ASSOCIATIONS: Nauchno-issledovatel'skiy institut shinnoy promyshlennosti (Scientific-research Institute of the Tyre Industry) and Nauchno-issledovatel'skiy institut lateksnykh i rezinovykh izdeliy (Scientific-research Institute for Latex and Rubber Products)

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1. Synthetic rubber--Dehydration 2. Synthetic rubber--Vulcanization

content had to be reduced to 4-5% before this temperature could be applied. The temperature should be raised as drying proceeds. Figure 6 shows the rate of reduction of moisture with - Curves 1 constant core temperature of 110 °C and, Curves 2, increasing core temperature as drying proceeds. From this work, parameters were derived for drying an actual latex product by combined conduction and radiation heating.

The experimental apparatus shown in Figure 7 is set up to dry and vulcanize a bathing shoe of 2-3 mm thickness at the time the gel was formed. Table 1 shows the properties attained in different parts of the shoe, with various heating regimes.

Table 2 shows the effect of vulcanising at various temperatures for different length of time on this Nr 4 latex. This suggests that optimum conditions are obtained at the higher temperatures for short times. Finally, Table 3 shows an optimum drying and vulcanising regime for production of an actual shoe from this latex. It calls for a two-hour drying period with temperatures raised from same story but in this case the three diagrams are for top, middle and bottom of the specimen and four curves are plotted on each diagram for four temperatures from 70 - 130 °C. These curves suggest that the optimum core temperature is 110 °C.

Tests were then conducted with combined heating, using a 500 W infra-red lamp and holding the core temperature at 110 °C. The three diagrams in Figure 3 are for top, middle and bottom of the specimen and the four curves on each diagram are for different voltages applied to the lamp - Curve 1 without radiation, to Curve 4 with lamp at 180 V applied. The separate diagrams in Figure 4 are for no volts, 110 V, 140 V and 180 V, respectively and the three curves on each diagram are, 1 for top, 2 for middle amd 3 for bottom of the specimen.

The temperature at which pore formation, at any given moisture content, occurs must be the limiting factor. Figure 5 shows the relation between these two factors. With an initial moisture content of 35%, the specimen temperature must be below 112 °C. The latex specimens, tested, vulcanise at 150 - 160 °C. Consequently, moisture

suffers from difficulties through corrosion of the electrodes.
The preferred method, therefore, is one of drying by conduction from a heated core on which the gel is laid. Water evaporates freely from the exposed surface but vapour held between the gel and the core inhibits migration to the under-surface. The heat taken in from the core is not sufficient to ensure intensive drying at thick sections, so supplementary heating was provided by radiation from an infra-red lamp above the gel. With this method, the processes of drying and of vulcanisation are inseparable. Experiments were made with gels from latex Nr 4, using specimens 200 mm dia. and 12 mm thick, laid on an electrically heated plate or core. Layers were cut from top, centre and bottom of these specimens throughout the drying time for moisture determination. The curves in Figure 1 show percentage moisture against time, in hours, for drying by conduction from the heated core alone. The four diagrams are for four different core temperatures and Curve 1 is for top, Curve 2 for middle and Curve 3 for bottom of the specimen in each case. Figure 2 shows the

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AUTHORS: Malkina, Kh.E., Pukhov, A.P. and Savinkova, A.M.

TITLE: Methods of Drying and Vulcanising Latex Products (Metod sushki-vulkanizatsii izdeliy iz lateksa)

PERIODICAL: Kauchuk i rezina, 1958, Nr 7, pp 21 - 26 (USSR)

ABSTRACT: Although water in latex gel is only loosely held to the material, drying is slow because of low internal diffusion. Latex products cannot be dried effectively by convection. With an initial water content in the gel following syneresis of the order of 40%, drying temperatures are limited because of the danger of formation of pores. The possibilities of high-frequency heating are considered to be limited because an air gap must be allowed between the electrodes and the gel to permit the water vapour to escape and the voltage necessary to overcome this air gap will give rise to high current in the gel, since the internal resistance of the wet gel is comparatively low. The high current may spoil the product, and in any case the gel will lose heat rapidly to the more massive core on which it is laid.
Short-circuit heating, by passing current directly through the gel, becomes slow as the gel dries off and

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62B-2-3/8

Decrystallisation of Natural Rubber by Heating with a High Frequency Electric Current.

distributed when the generator ЛГД-30 with one earth electrode is used. This is caused by the large concentration of the electric field near the high potential electrode which has a smaller surface than the low potential (earthed) electrode. Comparative data on decrystallisation methods for natural rubber are given in a Table on page 33. This method makes it possible to suppress resinification of the rubber, thus improving its quality. To ease the process of decrystallisation, and to improve the sanitary hygienic conditions of work, the chambers used for the decrystallisation do not require long heating, and therefore can be used continuously as well as periodically. The chambers can also be used for the decrystallisation of chloroprene rubber. There are 8 Figures and 1 Table.

ASSOCIATION: Leningrad Tire Plant, Scientific Research Institute of the Tire Industry. (Leningradskiy shinnyy zavod, Nauchno-issledovatel'skiy institut shinnoy promyshlennosti).

AVAILABLE. Library of Congress.

Card 3/3

1. Rubber-Processing 2. Rubber-Decrystallization 3. Rubber-Electrical properties 4. Rubber-Induction heating

Decrystallisation of Natural Rubber by Heating with a High Frequency Electric Current.

rubber decreases to 10 - 20 units on melting of the rubber crystals, and the rubber can then be processed mechanically. Natural rubber is an excellent dielectric, and its characteristics are given. . Natural rubber has a coefficient of dielectric loss = 0.006 - 0.100 (generally 0.02 - 0.06). It can be successfully heated in a high frequency electric field. The Leningrad Tyre Factory has introduced a plant for the decrystallisation of natural rubber, consisting of a heating chamber and a generator TV | type ЛГД -30 (viz. Fig. A and B, page 32); details of the plant are given. When heating natural rubber with high frequency currents it is observed that (1) when heating to a temperature of 140°C no detrimental signs of resinification of the natural rubber occurs due to the short period of influence of increased temperature, (2) when natural rubber is heated to a temperature above 40 - 45°, the strength of the bonds between the protective and the remaining foils, and also between the separating foils, is lowered which makes it easier to remove the protective layers to separate the foils. The temperature is not uniformly

MALKINA KH E

62B-2-6/8

AUTHORS: Kibal'nikov, V. I; Malkina, Kh. E; Pukhov, A. P; Tikhomirov, P. I.

TITLE: Decrystallisation of Natural Rubber by Heating with a High Frequency Electric Current. (Dekristallizatsiya natural'nogo kauchuka putem nagrevaniya elektricheskim tokom vysokoy chastoty).

PERIODICAL: Kauchuk i Rezina, 1958, Nr.2. pp. 31 - 34. (USSR).

ABSTRACT: Natural rubber has a congealed structure and is not elastic (the hardness of the surface = 60/70 units, according to Shore). It cannot, therefore, be processed mechanically without preliminary decrystallisation. It is usually decrystallised by heating with the aid of a hot air current in special chambers with a periodic, uninterrupted or combined action; deficiencies of these chambers are discussed. Decrystallisation of natural rubber, by heating with high frequency current, makes it possible to make use of the influence of the heat - inertia properties of natural rubber on the rate of the process and thus decreasing the duration of the decrystallisation process. The transition from the crystalline to the amorphous state takes place when heating to a temperature of 45°. The hardness of the

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MALKINA Kh. E.

KOROTKOVA, A.A.; MALKINA, Kh.E.; PUKHOV, A.P.; FOMINA, L.S.

High-frequency drying of latex sponge. Kauch.i rez.16 no.9:9-11 S '57. (MIRA 10:12)

1. Nauchno-issledovatel'skiy institut shinnoy promyshlennosti i Nauchno-issledovatel'skiy institut rezinovykh i lateksnykh izdeliy. (Foam rubber--Drying) (Induction heating)

APPROVED FOR RELEASE: 06/23/11: CIA-RDP86-00513R001031900051-6

MALKINA, Kh. E.

67. Use of high frequency dielectric heating in the technology of rubber manufacture. Kh. E. Malkina and A. P. Pozngy. Kauch. i Rezina, 1957, 16, No. 4, 23-6. Considering the dielectric properties of natural and various synthetic rubbers mixed with carbon black the author deduces their dielectric heating behaviour. Data on the dielectric properties of unfilled and filled natural rubber, SKS-30A and SKB mixes are given. There are 9 references. 30780

MALKINA, KH. E.

Malkina, Kh. E.

"Investigation of new methods of heating in the technology of rubber production (TVCh electric heaters)." Min Higher Education. Moscow Inst of Chemical Machinebuilding. Moscow, 1956. (Dissertation for the degree of Doctor in Technical Sciences)

Knizhnaya letopis'
No. 35, 1956. Moscow

APPROVED FOR RELEASE: 06/23/11: CIA-RDP86-00513R001031900051-6

Distr: 4E3d/4E2c(j)

1949. Increasing bond strength between components of tyre covers by thermal treatment. [illegible] and [illegible]. [illegible] 1954, p. [illegible] (Vses. Khim. Obshch. im. D. I. Mendeleeva, 1954). Heating tyre covers prior to moulding and vulcanisation, to a temperature at which pore formation and prevulcanisation do not occur, increases the bond strength and increases the life of the tyres. The best method is h.f. heating, which is rapid and uniform and does not involve alterations to mix formulae or to the construction.

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MALKINA, KH. E.

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4383. Obshchaya tekhnologiya rezinovogo proizvodstva (General Technology of Rubber Industry). KH. E. MALKINA. Moscow: Gosudarst. Nauch.-Tekhn. Izdatel'stvo Khim. L[illegible] 1952, pp. 192, *Chem. Abs.* 1955, 49, 2769.

012

MALKINA, Kh. E., jt. au.

Raising the serviceability of automobile tires; for drivers Moskva, Izd-vo Ministerstva Kommunal'nogo Khoziaistva RSFSR, 1952. 31 p. (54-21[illegible])

TL270. M4

MALKINA, I.S.

Photosynthesis of young growths under the canopy of a forest. Bot. zhur. 50 no.5:673-679 My '65. (MIRA 18:6)

1. Laboratoriya lesovedeniya, [illegible] Uspenskoye Moskovskoy oblasti.

APPROVED FOR RELEASE: 06/23/11: CIA-RDP86-00513R001031900051-6

KARAPAYEV, B.T.; MAL'[illegible]A, [illegible]

Determining the content of surfactants in waste waters. Neftepер. i neftekhim. no.7:9-13 '63 (MIRA 17:7)

1. Vsesoyuznyy nauchno-issledovatel'skiy institut neftegazovoy promyshlennosti.

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GLAUBERZON, Ye.M.; MALKINA, I.D.

Fluorescent lighting at the "Pervomayskaya" Factory in Leningrad. Svetotekhnika 7 no.5:22-25 My '61. (MIRA 14:6)

1. Fabrika "Pervomayskaya" i LO Gosudarstvennogo proyektnogo instituta "Tyazhpromelektroproyekt".
(Leningrad—Fluorescent lighting)

MALKINA, E. S.

MALKINA, E.S.

Rh factor. Fel'd. i akush. 22 no.11:47-48 N '57. (MIRA 11:2)

1. Sverdlovskiy nauchno-issledovatel'skiy institut okhrany materinstva i mladenchestva
(RH FACTOR)

L 35336-66 EWT(m)/EWP(t)/ETI IJP(c) JD/JG

ACC NR: AP6012906 (A) SOURCE CODE: UR/0075/66/021/004/0459/0462

AUTHOR: Tiptsova, V. G.; Malkina, E. I.; Anisimova, Z. A.

ORG: Moscow Institute of Steels and Alloys (Moskovskiy institute stali i splavov)

TITLE: Chemical spectrum determination of impurities in mercury

SOURCE: Zhurnal analiticheskoy khimii, v. 21, no. 4, 1966, 459-462

TOPIC TAGS: mercury, fatty alcohol, spectrum determination

ABSTRACT: A study has been made of the use of fatty solvent extraction of mercury from hydrochloric solutions. It was found that isoamyl alcohol is the best extractant for separating mercury from impurities in 2—3 M HCl. A method for determining the chemical spectrum was developed for Mg, Mn, Ag, Al, Pb, Ni, Cu, Ca, Cd, and Zn in mercury with an average sensitivity of 10^{-6}—10^{-7}% for each element. Orig. art. has: 1 figure and 3 tables. [Based on authors' conclusions.] [NT]

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Card 1/1 UDC: 543.42

MALKINA, E., inzh.; BAKLYKOV, V.

Works of the Svedlevsk Fire Research Station. Pozh.delo 4 no.9:4-7 S '58. (MIRA 11:9)

(Sverdlovsk--Fire prevention--Research)

MALKINA, D.L.; RAIMOVA, N.K.

Effect of experimental hypercholesteremia and a partial depancreatization in frogs on the phenomenon of Sechenov's inhibition. Nauch. trudy Kaz. gos. med. inst. 14:221-222 '64. (MIRA 18:9)

1. Kafedra normal'noy fiziologii (zav. - prof. I.N.Volkova) Kazanskogo meditsinskogo instituta.