100
YEARS OF CHEMICAL FIBERS' DEVELOPMENT IN RUSSIA
Dear colleagues, comrades, friends!

With all my soul I wish to congratulate you on the occasion of the great event – 100th anniversary of chemical fibers industry’s creation in Russia.

I strongly believe that our industry will continue to successfully develop in the future creating new, more sophisticated materials for the benefit of our country, to the good of Man.
In October 2009 it is 100 years since a day when a small viscose silk factory started operating in Mytischi village close to Moscow.

This date could be considered the birthday of chemical fibers industry in Russia. Further development of the Industry is integrally connected with the history of our country.

Formation of capitalistic industry, the Great October socialist revolution, Civil War in Russia, formation of the Soviet power, build-up of the socialist industry, the Great Patriotic War of the Soviet people, construction of Communism, crisis of the socialist system, build-up of new post-Soviet Russia – all political and economic events in the country are directly reflected in the history of scientific and industrial accomplishments related to chemical fibers.

The objective of this historical survey is to recall and appreciate all those achievements and to try on the basis of such an appraisal to conceptualize further evolution of the chemical fibers industry in twenty-first century Russia.
Milestones in formation and development of science and technology of chemical fibers in Russia

In October 1909 a viscose silk factory started operating in the Moscow suburban village Mytischi. The factory was owned by Aglo-Belgian stock company “Viscoza”. The factory’s machinery was imported to Russia from England and Germany; the raw materials also came from abroad.

300 labor personnel and specialists worked at the factory. Charles F. Cross, an English chemist and one of the inventors of Viscose process of fiber manufacturing was the first technical manager of the enterprise. The factory produced 300 kg of fiber per day for export only.

As a result of the February revolution in 1917 “Viscoza” factory came under control of Mytischi Council of Workers Deputies. Workers dismissed the former director and took over the factory’s management.

The Great October revolution’s victory started socialistic transformations in Russia and the factory was consequently nationalized at the end of 1918. However due to the lack of raw materials caused by the foreign suppliers’ boycott viscose manufacturing was impossible.

Thanks to hard persistent work of the management, labor and engineering personnel and the support provided by state authorities “Viscoza” factory was rehabilitated and on March 2, 1924 the first Soviet viscose yarn was produced.

By 1926 all spinning machines of the factory have been put into operation again by the efforts of the working collective and the original factory’s productivity –about 300 kg of viscose yarn per day have been reached.

In 1928 new machinery from Germany was delivered, installed and started making it possible to increase viscose yarn daily production up to 2 tons and by this ensure development of the country's haberdashery and knitting industries.

“Viscoza” factory’s reconstruction completed in 1929 made it possible to ensure implementation of a full cycle of viscose silk production that met international standards.

In April 1931 the Scientific Research Institute of Synthetic Fibers (NIIV) was founded on the basis of the country’s first laboratory of synthetic fibers of Karpov Physics and Chemistry Institute.

The same year NIIV and “Viscoza” factory merged. The new enterprise named the Scientific Research and Production Enterprise of Synthetic Fibers was quartered at the factory’s territory in Mytischi.

In 1936 a specialized Institute of Synthetic Fibers Industry Enterprises Design (GIPROIV) then recently formed on the basis of “Stroyvolokno” design bureau merged with the Scientific Research and Production Enterprise of Synthetic Fibers. The task of GIPROIV was new synthetic fibers producing enterprises design.

After the beginning of the Great Patriotic war in November 1941 due to the aggravating front line situation part of the enterprise’s machinery was dismantled and evacuated to the eastern part of the country. In 1941-1943 by efforts of NIIV specialists, designers and workers of Mytischi enterprise new plants manufacturing products for the front were built and launched in Kustanay, Namangan and Armavir.

In spring 1942 rehabilitation of the Mytischi “Viscoza” factory started. First lots of Marlin viscose material, cellophane film, and viscose cases for smoke-box fuses were produced.

In 1945 chemical fibers factory that was a part of the Scientific Research and Production Enterprise of Chemical Fibers was awarded the status of the Research and Experimental Plant of Chemical Fibers Institute. GIPROIV became an independent design organization.

In 1947 NIIV was named the All-union Scientific-research Institute of Chemical Fibers (VNIIV).
In May 1958 a course toward “Big Chemistry” was shaped by the Resolution of the CPSU Central Committee.

In 1959-1965 on the basis of technologies developed by VNIIV twelve large enterprises and a number of new production lines of working plants were built and put into operation.

In 1960-1961 new VNIIV branches were opened in Kiev and Krasnoyarsk. On the basis of VNIIV branch in Kalinin the All-union Scientific-research Institute of Synthetic Fibers (VNIISV) was established and a large part of R&D in the field of synthetic fibers manufacture was delegated to that Institute.

In 1966 a department of implementation was created within VNIIV in order to liquidating the lack of organizational association between the Institute and various plants of the industry. The number of the VNIIV engineering designs introduced to the industry grew three times as compared with the previous year.

In 1971-1975 VNIIV economic efficiency was doubled.

In 1976 “Khimvolokno” Research and Production Association (NPO “Khimvolokno”) was established in order to accelerate practical introduction of the results of scientific research. It included All-union Scientific-research and Design Institute of Chemical Fibers (VNIIVproject) –VNIIV with the experimental plant, Leningrad branch with experimental plant, Kiev branch and Kiev experimental workshops, Serpukhov and Shuisky plants of man-made fiber (since 1979).

NPO Khimvolokno employed over 2.5 thousand of scientists including 217 candidates of science and 15 doctors of science. 400 inventor’s certificates were awarded to the research workers of the institute in 1976-1980.

In 1991 NPO “Khimvolokno” split up into independent enterprises. The Institute was titled State enterprise “All-union Scientific-research Institute of Polymer Fibers” (GP VNIIPV).

In 1992 the research and production enterprise LIRSOT Ltd. was created. The enterprise was specialized in R&D of technologies for polyimide fibers, materials and polyimide-based products manufacturing.

In 1993 in order to preserve and develop the unique Russian technology LIRSOT Ltd. purchased from GP VNIIPV the exclusive license for polyimide technology, know-how, manufacturing and use of polyimide products including three trademarks: “Arimid”, “PION” and, “TVIM.”

“LIRSOT” at the same time financed the GP VNIIPV scientific-research laboratory and experimental polyimide fiber production line, including repair and restoration works and necessary infrastructural start-up operations. The company has also patented in Russia and abroad polyimide fibers and materials manufacturing technology (14 patents).

In 1996 due to the difficult financial situation GP VNIIPV was placed into external administration. In 1999 insolvency administration was introduced. All this led to total bankruptcy and sale of the Institute assets in 2003 to LIRSOT Ltd. that became the assignee of GP VNIIPV.

Since 2003 till present time LIRSOT Ltd. has rehabilitated and modernized the research and production complex of the enterprise where R&D works are being carried in the area of improving existing and creating new national fibers together with their experimental and industrial manufacturing.

The experimental plant produces polyimide fibers, “Arlana” aramid improved technology fibers, as well as high-tenacity and high-modulus carbon fibers, hollow fibers and ultra-filter devices developed by LIRSOT Ltd. A big variety of materials and products have been created on the basis of fibers produced by LIRSOT Ltd.
The development of the man-made fiber manufacture in Russia is closely connected with achievements of Russian scientists in improving production processes and developing new fibers.

In 1929 country's first research laboratory of chemical fibers was set up at Karpov Physics and Chemistry Institute where a number of technological problems of acetyl cellulose and viscose fibers production were solved that transition from imported to national raw materials use.

In the early 1930's NIIV scientists' research resulted in development of unique technological solutions that later were widely used. In particular a group of researchers led by E.L. Gruz and M.A. Glazman developed a technological process for production of cupric-ammoniac fibers with harmlessness being its main characteristic.

At the end of 1933 pilot units for production of acetyl cellulose and acetate textile thread were developed. The problem of creation of dyes for acetate silk was solved.

In 1935 country's first experimental machine for cellophane film production was designed and put into operation. The same years the results of scientific research on substitution of lead with chemically resistant rust preventive coatings were introduced.

In 1938-1941 a group of specialists headed by NIIV scientist N.V. Mikhailov improved viscose filament yarn production process in centrifugal spinning machine that provided an opportunity for car tires rayon cord manufacturing. By May 15, 1941 the Mytischi factory had produced first 3 tons of robust cord threads.

An extensive scientific research was undertaken in order to develop acetyl cellulose and acetate fiber and country's first experimental-production unit was built. The scientific basis for surface-acetylated fibers, mixed ethers of cellulose for aircraft lacquers and acetate film-based “triplex” safety glass production was created.

By the end of 1943 as a result of scientific research first samples of polyamide resin and polyamide resin fibers lately named Kapron have been obtained. Serial production of Kapron was launched at Klin plant of chemical fibers in 1949.

During the fifth five-year plan period VNIIV developed new chemical...
materials for the industry: Lavsan, Anid, Nitron, as well as highly durable and chemically stable Soviden and Ftorlon.

Basic theoretical research works undertaken by the physics and chemistry laboratory staff facilitated a lot to the subsequent development of fundamentally new types of chemical fibers production methods.

In 1955 Mogilev plant started production of viscose filament yarns initially produced at VA units designed by the VNIIV specialists. New technologies of spin dyeing of staple fibers, tire yarn with breaking length of 32 km production, Kapron thread of various colors and viscose stapled yarns were introduced.

By the end of 1959 the Institute laboratory developed cheaper Kapron cord thread with linear density of 93.4 tex.

In the early 60’s VNIIV scientists succeeded in increasing viscose cord density that allowed to increase cord-based tire life period by 20-30%.

In 1962-1965 the scientists developed polypropylene fibers production technology – the cheapest synthetic material that is widely used for ropes, upholstery fabrics, fishing nets manufacturing etc.

In 1964 poly nosic viscose rayon fibers technology and production equipment research was finalized.

In 1967 new hi-bulk composite threads Komelan for knitwear were developed and machinery for their manufacturing was designed.

Viscose crimped matt fibers production technology as well as viscose filament yarn in packs high-frequency drying technology were developed and introduced to the industry.

In the early 70’s for the first time in the history of the Soviet chemical fibers industry national inventions were patented in England, France, Italy and other countries.

In the second half of the 70’s spinning-and-finishing plants gas ultimate cleaning systems were developed and designed and alkali-hydrochinone method for treatment of ventilation releases with absorbing solutions was introduced.

An ingenious direct spinning throwster for tire yarn; a high-speed process of tire yarn production using shuttleless weaving machine, a technology of pneumatically-knitted yarn production, a shortened process of warping the acetate fiber with lowered twist directly from spin packs to section spools for knitwear goods industry were developed.

New high-tenacity fiber materials including carbon fibers were developed: “Ural” high-tenacity high-modulus viscose-based carbon fiber introduced at Svetlogorsk plant of artificial fibers in 1974; UKN, Argon, Granit, Elur-P and, polyacrylonitrile-based Lu-P tapes, introduced at Balakovo industrial complex of chemical fibers (today – “Argon”, Ltd.).

Heat-resistant fiber with polyphene “Lola” based conceptually new flameproof fabric was developed for the Soyuz-Apollo space flight. Suits made of that fabric provide astronauts with high level of comfort and safety.

A broad assortment of medical materials for manufacturing of artificial blood vessels, for relieving consequences of burns and for anesthesia was developed.

In the early 80’s new chemisorbing and hollow semi-permeable fibers were created and became the core part of gas and water filtering devices.

In 1976-1980 period the Institute’s specialists were awarded 400 inventor’s certificates.

In the second half of the 80’s new organic high-tenacity high-modulus heat-resistant SVM and Armos fibers were created. Fibers with high sorption properties were developed for gases purification, sewage treatment and, extraction of precious components; fibers for medical purposes; bioactive fibers; electro-conductive fibers; semi-permeable fibers for separation of gases and fluids; high-tenacity silicon carbide fibers etc.

In 1993 The rights for the technology, know-how, and manufacturing of the polyimide production on exclusive license basis were transferred to “LIRSOT”, Ltd. that is carrying out a big volume of scientific research and projects in that field from that moment.

In 2003-2009 on the basis of the scientific complex restored by the scientists and technologists of “LIRSOT” a wide spectrum of scientific research is being undertaken to improve polyimide, aramide, carbon, hollow, and chemisorbing fibers, to provide them new unique properties and transform them into a variety of materials, articles and composites.
The first production of a factory set up in 1918 by an Anglo-Belgian joint-stock company was viscose silk produced of the raw materials imported from Switzerland and Italy. The productivity of the factory’s equipment was 300 kg. per day.

The production of the viscose filament yarn was resumed after restoration and reconstruction of the factory in 1926. The manufacturing rate reached 2 tons of viscose yarn per day after installation of new equipment in 1928.

In 1930 manufacturing of viscose yarn was launched at new factories in Mogilev, Leningrad and Klin with the total capacity of 9 tons of yarn per day.

In 1935 construction of three cup-ammonium fiber production blocks of with the capacity of 5 tons a day started on the basis of an experimental plant of Rostokino wool factory in Moscow. Later on production of a new type of artificial fiber began at operating textile factories in Shuya, Kalinin and Vyshniy Volochok.

In 1937 the production run started in the newly built Kiev factory equipped with domestically made machinery.

In 1938-1941 the first in the USSR large experimental-production unit for manufacturing of acetyl cellulose and acetate fibers was built at Mytischi industrial complex.

New industrial enterprises have being created with direct involvement of the NIIV specialists and research workers.

In 1941-1943 during the Great Patriotic War on the basis of the equipment evacuated from the cities of Mytischi and Klin new plants were built and put into operation in the cities of Kustanay, Aramil and Namangan and started defense products manufacturing of the front.

In spring 1942 “Viscoza” factory produced the first meters of the Marlin viscose material.

In 1948 first the USSR production of “big Kapron” started operating at Klin plant of artificial fibers – the outcome of the years of work carried out by VNIIV scientists.

In 1948-1949 production of chemical fibers reached the pre-war level. Restoration Klin, Lesogorsk, Mogilev, Leningrad and
Viscose crimped matt fiber production technology was developed and applied at Ryazan complex.

Packed viscose filament fiber high-frequency drying unit mastered at Mogilev artificial fiber plant.

Ural viscose-based high-tenacity high-modulus carbon fiber production was introduced at Svetlogorsk artificial fiber plant.

UKN, Argon, Granit, Elur-P carbon fibers and materials, as well as polyacrylonitrile-based Lu-P tape production was started at Balakovo chemical fibers industrial complex (today – “Argon”, Ltd.).

VNIIV Leningrad branch mastered experimental-industrial production of the SVM fiber and arymide yarn.

In 1978 Oksalon heat-resistant yarn and the Oksalon-based sifting cloth production for the non-ferrous metallurgy experimental-industrial unit was developed and mastered at Svetlogorsk artificial fiber plant.

In the second half of the 80’s SVM and Armos fibers production applied at Kamensk and Tver branches of “Khimvolokno” industrial association.

Aramid, Terlon and Lola staple fibers production for Buran space craft heat-protective components manufacturing started at VNIIproject experimental plant. PAN (polyacrylonitrile) rope production for Argon type carbon materials manufacturing was organized at Saratov synthetic alcohol plant (later – PO“Nitron”).

Since 1993 polyimide fibers production has been carried out on the basis of GP VNIIPV experimental plant collectively by “LIRSOT”, Ltd. and Institute specialists who developed a number of materials and products, patented and applied them at Russian enterprises.

Since 2003 “LIRSOT”, Ltd. Is developing and manufacturing various modified polyimide and aramide fibers; improving the existing high-tenacity and high-modulus carbon fibers industrial technologies, hollow fibers and filtering units production. “LIRSOT”, Ltd. products users are the largest aerospace, atomic energy, defense industries and other industrial sectors enterprises.

“LIRSOT”, Ltd. R&D products were presented at all international air-space and industrial exhibitions and were awarded with medals and diplomas.

other chemical fibers enterprises destroyed by the war was completed.

To resolve the issues of construction of large multi-specialized plants equipped with modern machinery several thematic branches of VNIIV were set up in Serpukhov (acetate and chlorine fibers), Shuya (cuprammonium fibers) and Leningrad (staple fibers and carbon bisulfate) by the order of the General Directorate of artificial fibers.

In 1951 first viscose staple fibers production unit was put into operation at Kalinin plant. Production of viscose cord was launched there two years later. In 1952 first industrial production of Kapron fibers was launched at Kiev complex. Klin cellophane shop started production.

In 1954 Serpukhov artificial fibers plant of reached the projected capacity.

In 1955 Mogilev plant started manufacturing filament which for the first time was made of the viscose produced at VNIIV-developed VA-units.

In 1960 for the first time in the USSR newly commissioned Kursk synthetic fiber plant began industrial application of Lavsan production technology developed by the VNIIV polyester laboratory.

In 1962 propylene fibers manufacturing was organized at Kursk synthetic fiber plant.

In 1963 the cord producing complex №1 of Balakovo chemical fibers plant was commissioned by the State Inspection Board.

In the first half of the 60’s a new complex of experimental machines for viscose and heat-resistant fibers production was put into operation at VNIIPV experimental plant.

In 1965 the largest in Europe production of triacetate and acetate fibers launched at Kaunas artificial fibers plant.

In the early 70’s Komelan bulky yarn and the Acetochlorine fire-resistant fiber production lines were put into operation at Serpukhov chemical fibers plant. Acetate yarn manufacturing on the warper’s bobbins short-cycle technology was developed.

Crimped continuous line of coarse count from the polypropylene and Kapron fibers production technology was developed and applied at Kursk and Kiev chemical fibers plants.
Looking into the Future

The historical experience of creation, formation and development of chemical fibers in Russia is inseparably associated with the 100 years of the enterprise in Mytischi city, starting with Anglo-Belgian factory “Viscoza” and to “LIRSOT”, Ltd. research and production company. This permits to look forward with optimism about the future of this essential and upcoming sector of Russian industry.

The future is being made today. “LIRSOT”, Ltd. specialists are improving polyimide fiber products quality and polyimide fibers characteristics, developing new carbon fibers with unique characteristics. New areas of application have been opening for hollow and chemisorption fibers.

The research workers of our enterprise explore new opportunities of polymer material features improving which emerge with the use of nanotechnologies making it possible to develop fibers and materials with varying characteristics depending on operational environment.

Practical implementation of scientists’ new ideas in today’s Russia context also requires new organizational approaches. In particular the most important condition for further efficient development of the Russian polymer fibers industry is creation of a new research-production complex capable of consolidating the work of scientists and production workers to provide all prerequisites for basic materials and final products manufacturing.

The day is not far away when Russian planes made of light and durable composite materials will take off, comfort and coziness will be provided in living modules of space stations with the help of polymer fabrics, convenient, nice-looking and at the same time providing safety for cosmonauts, and Russian cosmonauts, firemen, rescuers, and representatives of other hazardous employments will be dressed in protective suits made of domestic materials.

Our future is in our hands.

Merits and Awards of the Enterprise

1938 Red Banner of the People’s Textile Industry Commissariat and the Central Committee of the Textile Workers Union.
1942 The industry’s best enterprise title by the Order of the People’s Textile Industry Commissariat.
1970 CPSU Central Committee, CPSU Moscow Committee and Moscow Region Executive Committee Certificates of Merit. The enterprise’s name was placed on the City Board of Honors and listed in the Register of Mytischi District Labor Glory. “Enterprise of High Production Standards and Labor Management” title.
1975 Certificates of Merit of CPSU Moscow Committee and the Council of Trade Unions of the Moscow Region (MOSPS).
1978 All-Union Leninist Young Communist League (VLKSM) Central Committee Ribbon of Honor on the Red Banner.
1982 Order of Lenin.
2006 Diploma of the All-Russia Exhibition Center (VVC).
2007 Diploma of Honors as the winner in the “Best CIS Company” category of the International Prize titled the “Star of Commonwealth Badge of Honor”.
2008 Diploma and Medal of the 9th specialized exhibition “Double-purpose products and technologies. Diversification of OPK (defense and industrial complex)”.
2009 A.N. Kosygin Prize.