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ORGANIZATION OF RESEARCH IN THE COTTON GINNING INDUSTRY

by

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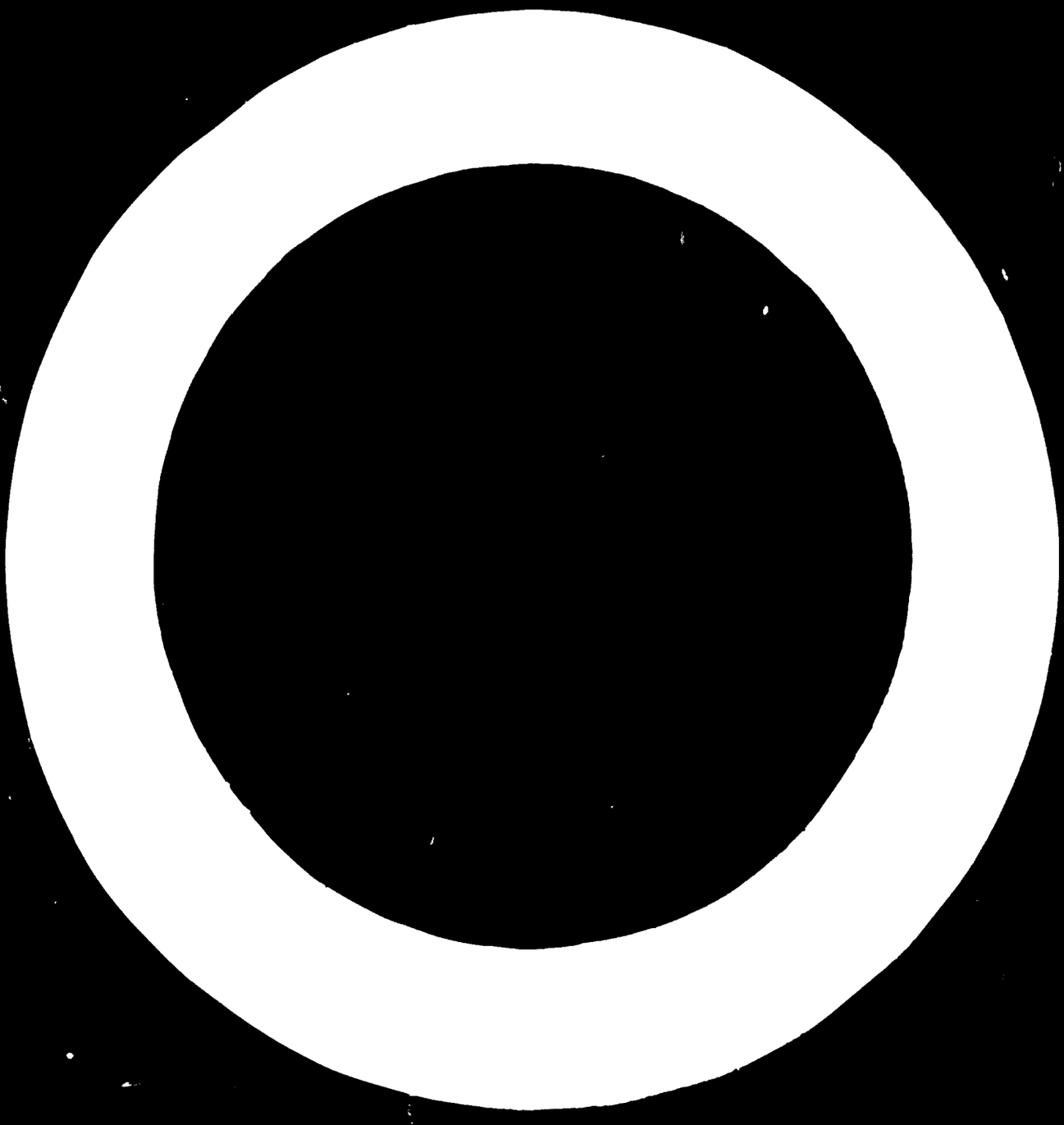

ORGANIZATION OF RESEARCH IN THE COTTON GINNING INDUSTRY

The subject of this paper is the organization of research in the cotton ginning industry of the Soviet Union. The purpose of the paper is to acquaint the participants in the seminar in brief with the operation of the cotton ginning industry, the arrangement and structure of its research establishments and the basic results of their studies.

Cotton growing is developed on the territory of six republics of the USSR -- Uzbekistan, Tajikistan, Turkmenia, Kirghizia, Kazakhstan and Azerbaijan. Accordingly these are the areas with a cotton ginning industry which procures raw cotton and ensures its primary processing.

As compared with the practice in other countries (for instance the United States) Soviet cotton growing farms deliver unginned cotton and not fibre. This has a very substantial effect on the structure and organization of the Soviet cotton ginning industry, which encompasses both procurement centres and cotton ginneries. Every cotton ginnery has affiliated to it several procurement centres where the farms deliver their crop. The procurement centres receive the cotton and pay the farms through the bank according to the amount and grade of cotton delivered. The procurement centre is also responsible for drying the cotton and removing waste material. The cotton is stored by grade and delivered to the cotton ginneries for processing.

This organization of the cotton ginning industry necessitated the development of a special state standard (GOST) for raw cotton while in the other cotton growing countries there is a qualitative assessment of cotton ginning products -- the

lint and the seed. The procurement centres in the Soviet Union are equipped with special cotton evaluation devices and machinery for loading cotton into storage which is also something that other cotton growing countries do not have.

According to existing standards in the Soviet Union raw cotton is divided into four grades according to appearance and quality characteristics.

The Uzbek Republic is the leading producer of cotton in the country and accounts for 71 % of all the fibre, seed and lint put out in the USSR. There are 2.4 million hectares of cotton plantations in the Soviet Union including 1.6 million hectares in Uzbekistan.

The Soviet cotton ginning industry was started in 1918 when the Government of the Turkestan Republic nationalized all key branches of the national economy. Due to the disrupted economy resulting from the Civil War only 60 out of the 200 semi-handicraft cotton ginneries in the region were in operation in 1918. In 1919 the number of cotton ginneries in operation went down to 35 and subsequently employment was cut down from11,000 in 1918 to 4,500 in 1919. Labour productivity in this branch of industry was just half of what it had been before the 1917 Revolution.For instance,the Andijan cotton ginnery with 8 gins in operation processed 2 rail wagons of raw cotton instead of 3-3.5 as before. The Assakinsky plant woth 10 gins processed 2 rail wagons of cotton instead of 4,etc. And so despite the considerable reduction in the sown areas and low yields,the cotton ginning industry at that time could not cope with the crop. By 1920 the stock of unginned cotton in Turkestan (as Central Asia was then known) reached 64,000 tons. The immediate result was a considerable reduction in cotton fibre deliveries

to the textile mills in Russia.

It must also be noted that at that period when the Soviet power was just being established throughout Turkestan, the cotton ginneries (located as a rule in the rural areas) developed into working class centres and promoted the consolidation of fraternal ties between the workers and peasantry.

The first important steps aimed at rehabilitating Soviet cotton growing and the cotton ginning industry were outlined in Decrees issued by the Council of People's Commissars in 1920 and signed by V.Lenin. These decrees provided for certain land tenure and water supply priviledges for the cotton growing farms. The formerly existing experimental fields and plant selection stations were restored and new ones organized. All the available seed material was taken account of and the seed of improved varieties of cotton was purchased. Existing irrigation systems were improved and new ones built.

The programme for restoring and organizing the Soviet cotton ginning industry also provided for the economically expedient distribution of cotton ginneries and their equipment with highly efficient machinery made inside the country.

By 1927 the region had 17 new cotton ginneries and a number of existing enterprises had been restored. There were 80 cotton ginneries in operation and by the end of the first five-year plan their number had grown to 90. The industry operated 643 gins and 336 linters and there was also an effective and ramified system of procurement centres.

The year 1925 saw the beginning of Soviet cotton ginnery machine building at the Nevsky Shipyards in Leningrad. In 1926 the Baltiysky Mechanical Works and the Putilovsky Machine Building Plant in Leningrad began quantity production of hydraulic

cotton presses. The introduction of the new machines which replaced small-power screw presses made it possible to improve pressing of fibre in bales, raise the payload of railway trucks and reduce costs in bale packing.

The development of the cotton ginning industry went hand in hand with research. An experimental cotton ginnery was organized in Tashkent in 1925 and its staff launched planned studies of all the basic processes (preliminary cleaning, ginning, linting, pressing, mechanization of work, etc.).

The further development of cotton growing and of the cotton ginning industry and the necessity for a machine-building industry to meet their requirements called for a broader scope of research in this field. In 1937 the Council of People's Commissars adopted a decision to reorganize the experimental cotton ginnery in Tashkent into the Central Cotton Ginning Industry Research Institute of the USSR.

Our Institute, as the leading research establishment in this branch, has been entrusted with a wide range of problems arising from the methods and technology of primary processing of cotton, improvement in quality of produce, development of highly-efficient machines and instruments, mechanization of labour-absorbing and difficult operations, automation of production and also the solution of problems related to economics and the scientific organization of labour in the industry.

In order to give you an idea of how the Institute copes with these tasks in practical terms it is necessary to mention the structure of the Institute, its staff and the affiliated bodies.

The Central Cotton Ginning Industry Research Institute comprises 15 research laboratories including 11 independent

sub-divisions and 2 departments. The Institute also has under it experimental work-shops and an experimental cotton ginnery located in Tashkent region. Besides, there is a branch department of the Institute in the Azerbaijan republic.

The Learned Council of the Institute comprises highly-qualified research workers from the Institute itself and from other research centres, as well specialists from industry, designing centres and higher educational establishments. At its meetings the Learned Council examines major scientific and engineering problems facing the Institute or the industry, the progress made in various research items, works out long-range plans of research in cotton processing and elaborates recommendations to industry.

The laboratories and sub-divisions of the Institute which are directly engaged in research activities have a staff of highly-qualified research workers with degrees and all the necessary instruments, equipment and electronic computers.

Practical experiments are conducted at the experimental workshops which manufacture all the required parts, units, models, etc. for the experimental testing of new equipment and mechanisms developed at the laboratories.

Besides, there is a practice of undertaking experimental research directly at the cotton ginneries and cotton procurement centres and in this the industry renders its whole-hearted support.

Another experimental cotton ginnery has been put into operation at the Institute recently. It will considerably facilitate experimental research. The ginnery is also to serve as a production base for the shaft ginning of fine-staple cotton and the processing of bast fibre. A big mechanical workshop

is to go up on the territory of the ginnery soon.

The Institute, including its branch department and experimental sections has a staff of 700 of which 200 are research workers (28 with a Ph.D. and 1 with a D.Sc. degree). At present three staff researchers are preparing to sustain their doctorate dissertations and another 10 are working for a Ph.D. degree.

During the years of its existence the Institute has trained a big number of research workers who are currently on the staff of the Institute or do scientific studies at other research and higher educational establishments. The workers of the Institute have received over 80 author's certificates for various invebtions concerning the methods and technology of primary processing of cotton. Over 700 collections of works, monographs, booklets, articles, instructions and other publications have been released by theInstitute outlining the results of its research. The staff of the Institute have won various awards at the USSR National Economy Exhibition in Moscow. In 1952 a group of staff members won the USSR State Prize for developing highly efficient equipment for the cotton ginning industry.

After a research has been completed and preliminary results approved the Institute works out the technological assignment and hands it down to the Special Designing Bureau For Cotton Ginning or any other specialised organization for the development of experimental models of machines, instruments or mechanisms . The organization works in close contact with the Institute and this ensures the introduction into the design of all the new ideas developed by the Institute.

The experimental model of the machine, instrument or mechanism which is built on the basis of the parametres developed by the Institute is first tested at the designing centre and

then given over for all-round industrial tests in which the workers of the Institute also take part. The results of these tests may necessitate improvements in the design or it goes immediately into quantity production and introduction at the cotton ginneries and cotton procurement centres.

In those cases when the results of research do not require development of machine or unit designs (as in the case of a new technological process, new regimen of treatment and processing of raw material, new method of production organization, etc.) the results are given over directly to industry for testing and introduction.

During the 32 years of its existence the Institute has made good progress in developing the science of primary cotton processing, in the engineering and organizational improvement of the cotton ginning industry so as to ensure its conformity with the rapid development of cotton growing and the requirements of the country's textile industry.

I would like to dwell at some length on these issues. During the initial period of its development the Soviet cotton ginning industry and our Institute concentrated primarily on the development and introduction of efficient Soviet-made equipment for the cotton ginneries, the creation of a machine-building industry, the construction of modern cotton ginneries, the furnishing of the industry with pneumatic transportation means and other means of mechanization. That period saw the creation of an all-metal gin with the pneumatic removal of fibre and the modernization of existing equipment.

The Institute conducted extensive studies in the field of seed linting which resulted in the development of a new and highly efficient brush linter. The Institute also developed

the fundamentals for the design of a hydraulic cotton press, for the large-scale introduction of pneumatic transportation devices. The grading and classification of raw cotton was also placed on a scientific basis.

By 1941 (the beginning of the Great Patriotic War of the Soviet people) almost all the 119 cotton ginneries of the country had been equipped with pneumatic transportation devices, special cleaning installations and powerful hydraulic presses for cotton.

After World War Two the Institute and the cotton ginning industry were set the task of developing a set of highly efficient technological equipment for quality production . The Institute focused attention on the study of the processes and regimen of operation in the basic technological machines, improved their designs, developed new equipment which was up to the new standards. The Institute developed and introduced into industry a new model of a single-chamber saw gin with a production capacity of 10-12 kg of fibre per saw per hour and also new types of cleaners (a screw worm cleaner for removing small particles and a saw cleaner for removing large particles from raw cotton).

The Institute also worked out the fundamentals for the design a new brushless linter with a capacity of 25 kg of lint per unit/hour and a yield of up to 2,5 % of the weight of the seed. This model was widely used in all newly-built linter sections of Soviet cotton ginneries.

The Institute consudted extensive studies in the field of mechanization of labour-absorbing operations in handling raw cotton. A special machine was developed to pack raw cotton into sacks and deliver them by a special belt conveyor. This enabled the cotton ginning industry to reduce labour expenditure

in the handling of cotton and to start integrated mechanization at the cotton procurement centres and ginneries during the period which preceded the introduction of the metho of loose cotton transportation.

Towards the beginning of 1950 the cotton ginning industry of the Soviet Union reached the pre-war level of production. With the further development of cotton growing the industry was set the task of increasing production capacity through the reconstruction of existing ginneries and the construction of new plants.It was also planned to raise the technical level and improve production processes. The Institute made its worthy contribution to the realization of this programme.

An important stage in the development of the cotton ginning industry began in 1955 with the large-scale introduction of harvester combines in agriculture. The new task facing the industry was to organize the cotton procurement centres and ginneries for the quality processing of machine picked cotton which has a higher humidity and litter content. The introduction of machine picking doubled and even trebled the rate of cotton deliveries and required new and effective means of mechanization to handle the enormous volume of cotton pouring into the procurement centres.

A programme of reconstruction of the entire production cycle at the cotton ginning enterprises was launched to cope with the new requirements. This programme was based on research conducted at the Institute in Tashkent in the field of methods and technology of primary processing of machine picked cotton and also on recommendations by the Institute for the development of new machines (cleaners,dryers,gins,etc.) based on modern and highly effective principles.

Drying and cleaning installations were built at all the cotton procurement centres and cleaning units were added to the equipment of the cotton ginneries. The Institute developed new parametres for the construction of new de-littering units with a high efficiency ratio for cleaning machine picked cotton. The latest models which are now operated in the cotton ginning industry have a cleaning effect of 80-85 %.

As a result of extensive work in fitting the procurement centres with drying and cleaning equipment and means of mechanization which have been developed mainly on the basis of parametres worked out by our Institute, they have been transformed actually into industrial enterprises — auxiliary shops of the cotton ginneries. The capacity of the procurement centers also went up considerably. In 1932 it was about 1,500 tons of raw cotton to one procurement centre while in 1967 it was already 10,500 tons.

The processing cycle of machine-picked cotton at the ginneries now includes continuous drying and cleaning operations which has been made possible through the utilization of modern cleaning and drying installations.

The basic unit — the gin has also been radically improved during these years. The latest Soviet model with an automatic drive and control has a production capacity of 12-13 kg of fibre per saw per hour, which is well above the average capacity in the country's cotton ginning industry.

All the cotton ginneries have introduced a new technological operation recommended by the Institute — post-ginning cleaning of fibre which ensures better removal of litter. The uniflow cleaner developed by the Institute and introduced at all the cotton ginneries is being replaced by a more efficient

three-chamber fibre cleaner which removed 40-45 % of the litter.

Our Institute conducts systematic research of shaft ginning of fine-staple cotton which cannot be processed by ordinary saw gins. A new shaft gin was designed with a fibre cleaner which makes it possible to produce good quality fibre from fine-staple cotton picked by machines.

The development and introduction at the procurement centres of such effective means of mechanization of labour-absorbing operations as cotton delivery installations, mobile belt conveyors and special trucks and trailers for the loose transportation of cotton facilitated the organization of a continuous cycle of cotton reception. It must be pointed out that the introduction of the method of loose transportation of cotton made it possible to free over 10,000 men in agriculture and the cotton ginning industry and to save up to 25 million roubles' worth of packing material per annum.

A special device developed by our Institute and intended for the reloading of cotton from piles into trucks is now being introduced in the cotton ginning industry on a large scale. The same device is used as a pneumatic delivery feeder of cotton. The use of these devices will considerably lighten work, free a big number of working hands for employment in other sections of the industry and ensure a reliable industrial production process.

The cotton ginneries of the country have expanded their linting units which was necessitated by the requirements to boost lint resources and provide industry with short-staple lint. The research conducted by the Institute in this

direction resulted in the development of a rational technological process of triple linting of the seed. A saw linter was developed by the Institute for the first and second removal of lint. It had a production capacity of 35-40 kg of lint per unit per hour and reduced the lint content in the seed down to 3 %. Another highly-efficient saw linter was later developed for all three operations and it is now in wide use. Its capacity is 50 % higher than in previous models and it also provides the partial cleaning of the lint.

The Soviet standard for lint provides three grades according to the degree of ripeness and quality of the seed : the first grade lint is produced from first grade cotton seed ; the second grade of lint is produced from seed of the second and third grades of cotton and the third grade of lint — from the fourth grade of raw cotton seed. There are also four types of lint depending on the length of the staple.

The Institute is working on machinery for the cleaning of lint after its removal from the seed . A simplified model has already been constructed and underwent successful tests. A more sophisticated machine is at present under construction.

It must be noted that due to a number of reasons cotton seed linting in the Soviet Union is conducted at the cotton ginneries while in the United States it is done at the oil extraction plants.

Until recently our cotton ginneries received sufficiently powerful press installations which provided high density of the pressed fibre, lint and fibre waste and also adherence to engineering norms in loading railway cars. On the basis of the thooretical research and experimental studies of pressing

processes conducted by the Institute and also the practical experience accumulated by industry a modernized model of a press was developed incorporating various devices to ensure mechanization of labour absorbing processes. The press is now in quantity production and is being introduced into the cotton ginning industry.

Contrary to the Soviet Union, the United States practises double pressing of cotton bales. American cotton ginneries put out so-called "flat" bales with a density half of what it is in Soviet-made cotton bales. This cotton is intended for domestic consumption and when taken up for export it has to be re-pressed. However, an increasing number of cotton ginneries in the United States are turning to the output of bales with a high density.

The Institute conducts studies in the field of automation in production processes. Centralised operation of equipment has been introduced at a number of ginneries and isotope regulating devices have also been widely introduced. The industry is making wide use of new instrumental methods of laboratory analyses for the qualitative evaluation of raw cotton, fibre and seed. During the last few years the Institute has developed a number of instruments and devices for this purpose. It must be pointed out that rapid and precise methods of determining the qualitative indices of raw cotton and produce based on the use of modern laboratory instruments play an important part in the industry. In view of this emphasis the Institute (jointly with designing centres) has developed devices for taking samples of cotton and cotton produce and also new instruments for the rapid determination

of humidity,littering and grade of cotton,(raw cotton and fibre),th residual fibrousness of theseed,the length of the lint and littering,which in the near future will allow the complete transfer to objective instrumental evaluation of the raw cotton,the fibre,lint and seed.

The introduction of new instruments and sample takers will ensure regular control of production,raise the standard of analyses and mechanize the work of laboratory assistants.

Extensive work is being done in the cotton industry to improve industrial safety provisions and sanitation conditions. A special laboratory at the Institute working in this field has already elaborated and introduced into industry standard fencing and various dust-removing installations. The laboratory also circulates special instructions relating to safe provisions and improved sanitation.It has also recommended for use the highly-effective cyclone-chamber and twin-stage cyclone air purifiers. Last year the Instotute completed research in the field of using the coronary electric discharge for settling dust.It has been found that the method is very effective in removong dust at the cotton ginneries.

The Institute conducts annual studies of the procurement and production activities of the cotton ginning enterprires,the quality of the cotton and its produce.The data thus obtained is used for drawing up recommendations to improve the work of the ginneries,to work out plans for the zonation of cotton varieties and to develop standards for cotton and cotton produce. The Institute also studies the storage regimen of cotton picked by hand and machine picked cotton in piles and in warehouses with the applica-

tion of effective preventive means ensuring preservation of quality in humid cotton.

Every year the Institute sends out to all cotton procurement centres and ginneries model standards for raw cotton which are used in quality evaluation of cotton delivered by the farms.

Studies are conducted in the economic aspects of the cotton ginneries, in their transfer to a new system of planning and material incentive and also in the field of scientific organization of labour and production.

There is a special laboratory at the Institute which specializes in the problems of primary processing of fibre crops (kenaf).

The cotton ginning industry is closely connected with agriculture and other branches of the national economy where cotton fibre, lint and seed is widely used. Hence the research conducted by the Central Cotton Ginning Industry Research Institute is co-ordinated and often conducted jointly with other research centres. For instance the problems of technological evaluation of new cotton varieties, plans for variety zonation and standards for cotton have been studied jointly with the USSR Cotton Research Institute, the Institute of Genetics and Seed Breeding and various establishments of the State Variety Inspection Board.

The Institute co-operates with the Central Cotton Textile Industry Research Institute in studying problems arising from the constant improvement of the quality of fibre produced by cotton ginneries in the light of requirements of the textile industry. Standards for cotton fibre and methods of testing raw cotton, fibre and lint are also

worked out jointly.

All the research aimed at improving the technology of lint production and raising quality to meet the growing requirements of customers are conducted at the Institute in co-ordination with the Synthetic Resins Research Institute, the Cotton Cellulose Research Institute and other scientific research centres.

The development of methods and equipment for the treatment of cotton seed before sowing is conducted jointly with the Plant Protection Research Institute. Research in standardization of cotton seed and quality control is conducted with the participation of research centres of the oil extracting industry. The Uzbek Academy of Sciences and its research centres offer valuable assistance to the Institute.

As mentioned earlier the elaboration of new models of machines and instruments was done by the special designing bureau for cotton ginning and the cotton industry instruments designing bureau on the basis of recommendations and assignments made by the Institute. The State Designing Institute No.4 is responsible for working out the blueprints of cotton ginneries involving technological processes elaborated by the Central Cotton Ginning Research Institute.

Thus there exists an efficient system of elaborating new machinery and production methods for the cotton ginning industry beginning from research and right up to the production of a new model or the blueprints of a modern enterprise.

The cotton procurement centres and ginneries are doing their share in promoting Soviet cotton growing. In their time these establishments directly participated in the land and

water reform and helped the organization of collective farms in the country.The cotton procurement centres and ginneries sign contracts with the collective and state farms,inspect quality of the plantations,participate in the testing of new cotton varieties and thus help develop Soviet cotton growing.The cotton ginning industry also provides agriculture with high-quality seed material.Besides,with the introduction of large-scale machine picking of cotton all the cotton procurement centres have been equipped with drying and cleaning installations and therefore relieved the farms of this labour-absorbing process which further facilitated the development of machine cotton harvesting.

The radical improvement in the equipment of the cotton ginning industry has considerably raised its basic engineering and economic indices which may be illustrated on the example of the Uzbek cotton ginning enterprises.

Index	Unit	1940	1950	1955	1960	1965	1967	1968
Average capacity of gins	kg/saw/hour	4.61	5.75	6.88	7.29	7.4	7.5	7.42
Average %% of removed lint weight against seed weight	%%	1.5	2.85	4.07	6.13	5.77	4.98	5.12
Volume of cotton ginned	thou. tons	1572	1852	2775	3017	3682	4034	4003
Fibre output per worker	tons	42.1	44.4	63.4	75.2	95.6	101	99
Electric power resources of cotton ginneries (1940 is taken as 100 %)	%%	100	238.6	264.1	594.1	794.5	830.2	1163

These indices have been achieved through the joint efforts of the factory workers,designers,researchers and

to a considerable extent through the theoretic and experimental studies conducted at the Central Cotton Ginning Research Institute.

The Institute which recently observed its 30th anniversary is faced with the responsible task of further improving cotton ginning machinery, technology and economics and also the quality of produce. This means that the Institute will conduct further studies in the fundamentals of primary processing of cotton and develop new and efficient machinery, units, instruments and progressive technology which are to ensure quality drying, cleaning and ginning of raw cotton, cleaning and pressing of cotton fibre and lint, regeneration and processing of fibrous waste, mechanization and automation of production processes, development of new and effective methods and instruments for the rapid determination of raw cotton quality and quality of produce. The Institute will also work further to improve the economics and organization of production in the industry.

Such are, in brief, some of the aspects in research conducted by the Soviet cotton ginning industry.

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