THE PRODUCTION OF WINDOW GLASS IN THE USSR

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Before the Revolution, glass production was an important branch of industry in capitalist Russia; in 1913 there were 275 glass works, with 75,000 workmen and a financial turnover of 65,000,000 rubles.

Manual labor was dominant in these works. Before the First World War the power units in the glass works, such as the largest at Mal'tsevskaya, were 10-35 horsepower steam engines, and the most powerful unit, at the Konstantinovka sheet-glass works, was a 100 horsepower steam engine. Horses were used in many plants.

The only means of glass production was by the arduous labor of glass blowers. Children were mercilessly exploited for this purpose. According to the data of the 1911 factory inspection, children and youths comprised one third of the total labor force.

The labor of the adult workers was so organized that, being obliged to take his "assignment" through all the production stages, from blowing of the cylinder to its conversion into a sheet, a master blower had to work for not less than 11-12 hours each day.

The ranks of skilled workmen were often augmented by foreigners, who often received higher wages than Russians for the same work. Foreign capital held a prominent position in the industry.

Attempts to mechanize sheet-glass production were started in Russia in 1911-1912 with cylinder drawing by the Lubbers and Sievert processes. However, they were not successful. In 1913 it was explained in the journal "Steklozavodchik" that this was "because of the lack of skill of our Russian workmen and some imperfections in the machines."

The labor productivity at the largest glass works, in Konstantinovka, in 1908 was only 630 poonds per man per year, or about 1800 m² of window glass.

During the years of the Civil War and intervention, the number of active glass works fell to 103, but in 1925, by the efforts of the party and Soviet Government, 129 works with 86,724 workmen were already in action.

Restoration of the old works was accompanied by planning of new mechanized works, with the most modern technological equipment.

Near the end of the same year, 1925, an important event took place — the construction of the first offspring of the Soviet glass industry, the "Dagestanskie Ogni" works, was completed.

In the following year, 1926, the first unit of 10 Fourcault machines was started up in the Konstantinovka works, and a similar second unit was put into operation in 1928. In 1929 and 1930 the first units in the mechanized works at Gus'-Khrustal'nyi and Belyi Bychok (Chagoda) were started up. Many large hand-operated plants were converted to the Fourcault process during the same period.

In 1931 we had 6 mechanized works in operation; in 1934 there were 17, and subsequently the number rose to 25. Manual production of window glass was abandoned even before the Great Patriotic War.

In 1955 the output per man at the October Revolution Window-Glass Works at Konstantinovka exceeded 6000 m² per year, which was a 3.3-fold increase over the prewar level at this works. The output of window glass in Russia in 1913 was 23,700,000 m², while in the USSR in 1957 it will reach 125,000,000 m², which is more than five times the prewar output.*

The Soviet Union has long held the first place in the world for window glass production.

An important part in improvement of the performance of the glass industry has been played by improvements in refractory materials. Instead of hand-made fireclay blocks of 20-22% porosity, tanks have been lined since

* Both values are in actual thicknesses. Calculated as glass 2 mm thick, the 1913 output was 14,000,000 m², while the 1957 output will be 179,000,000 m², or nearly 13 times as much.
Total output of window glass (calculated as 5.5 kg/m² glass) and growth of mechanization.

1932 with high-fireclay blocks pressed by pneumatic tools. Their porosity is down to 12-15% and the endurance is higher. This has reduced standstills of tank furnaces during overhauls and lowered the proportion of rejected glass.

In 1936 a process for production of tank blocks by fusion and casting, now used for the best refractory materials, was introduced in the USSR. The use of cast refractories has sharply lowered glass faults due to stones and cords, and has reduced breakage and waste.

After prolonged use of fused mullite blocks, aluminosilicate fused cast blocks containing a third component, zirconium dioxide, were developed and tested on the production scale. The service life of tank furnaces (between cold overhauls) increased by about 50% when fired fireclay blocks were replaced by fused blocks. A similar increase of furnace campaign is obtained with the use of zirconia-alumina refractories (bacor). Glass of exceptionally high quality is made in tanks lined with fused quartz blocks.

The growth of window-glass production in the USSR proceeded by different parallel routes: by broadening of the production basis and by acceleration of technological processes. This is illustrated by the following technicoeconomic data for the 1950-1955 period.

The total area of tanks used for production of window glass increased during this period from 4910-5330 m², or by 8.5%. During the same time the average daily pull from the total area rose from 2356 to 2783 tons, or by 18%. This was achieved by acceleration of the technological process and improved utilization of the melt.