Industrial plants producing glassware run into major difficulties when selecting diamond tools and cutting conditions for machining glass. At present the automatic lines for machining the ends of store-window glass, mirrors, and other articles use mainly diamond wheels on M1 and M5 binders, which can operate at travel speeds of the production line up to 2 m/min. Such glass machining speeds and the existing cutting tools hold down an increase in production.

Tools are needed which can operate under more stringent conditions and will provide maximum efficiency of the process. Especially acute is the problem of selecting the grinding conditions and characteristics of the diamond tools for rough grinding operations, where an appreciable allowance of glass is removed. These operations are most time-consuming and are accompanied by an appreciable consumption of diamonds, as a consequence of which production costs increase. Intense wear of diamond wheels leads also to a limitation of the travel speed of the production line and requires frequent alignment of the cutting tools and corresponding periodic adjustment.

This article presents the results of investigations which make it possible to recommend the most expedient grinding conditions and characteristics of diamond wheels, thus, ensuring maximum technological efficiency of diamond grinding of technical glass.

Machining of technical glass, having a chemical composition of 72% SiO₂, 0.4% SO₃, 1.4% Al₂O₃, 7% CaO, 3.5% MgO, and 14% Na₂O, was carried out under conditions of flat grinding on a 3G71 machine by means of straight APP 200 × 75 × 10 × 3 diamond wheels. Grinding was performed with copious cooling by means of a stream of a 1% aqueous solution of triethanolamine, the flow rate of which reached 10-12 liters/min. The duration of the experiment was 120 min of machine time of the wheel. Each experiment was repeated at least twice.

As the main indices characterizing the technological efficiency of grinding, we took the specific consumption of diamonds \( q \), mg/g, the productivity of the process \( Q \), g/min, and the roughness of the machined surface \( R_a, \mu \), according to GOST 2789-59.

The consumption of diamonds was determined by measuring the volume of the diamond-bearing layer of the wheel before and after the experiment, and the productivity was determined by weighing the specimen before and after the experiment. The roughness of the machined surface was determined on a profilograph-profilometer produced by the "Kalibr" Plant.

Before conducting the next experiment the diamond wheel was carefully dressed for 15-20 min by means of a wheel of green silicon carbide KZ 16 K SM1 or KZ K ST1 to obtain a rectilinear working surface.

The operating experience of plants shows that the cost of machining materials is greatly affected by the grinding conditions. The productivity of the process, wear, and service life of the cutting tools depend on the selection of the grinding parameters. The greater the values of the grinding depth \( t \), cross-feed \( S_c \), and longitudinal feed \( S_l \), the more material removed and the greater the effect of the shavings. During grinding of brittle materials, shavings of arbitrary shape are formed, their dimensions depending on...
on the indicated parameters. As a rule the hardness of the material being machined exceeds the hardness of the binder of the diamond wheel, and therefore the shavings are responsible for the main wear of the binder.

The effect of the shavings on wear of the binder will be different depending on their size and on the degree of filling of the depressions between the diamond grains.

The experiments show (Fig. 1) that as the grinding depth increases to a certain value, the wear of the wheel decreases and hence the specific consumption of diamonds also decreases. The minimum specific consumption of diamonds when grinding technical glass is observed at a grinding depth \( t = 0.5 \text{ mm} \), in which case \( q = 0.023 \text{ mg/g} \). Grinding with greater or lesser depths results in an increase in the consumption of diamonds and production cost.

The cross-feed \( S_c \) has no less an effect than the grinding depth on the technological efficiency of grinding. The magnitude of the working part of the diamond-bearing layer of the wheel participating in grinding changes depending on \( S_c \), i.e., the number of cutting grains and the area of contact of the binder with the material being machined change. The number of shavings between the diamond grains can increase with an increase of \( S_c \).

The results of experiments show (Fig. 2) that grinding of flat technical glass at \( S_c = 1.2 \text{ mm/run} \) provides minimum wear of the wheel. Greater and lesser values of \( S_c \) lead to an increase of wear of the diamond wheel and of the specific consumption of diamonds.

Longitudinal feed \( S_1 \) has a unique effect on the specific consumption of diamonds (Fig. 3). Whereas we can find the minimum value of the specific consumption of diamonds \( q \) at a comparatively high productivity of grinding by changing the depth and cross-feed, an increase of longitudinal feed always results in