Modernizing equipment used to fire refractory materials increases the operational reliability and cuts the expenditure for technical servicing and repairs. Modernization of rotary kilns and coolers at the Seversk combine involved using components produced by the Volgotsemmash and Katav-Ivanovsk factories or made by the repair shop of the combine itself.

Significant cuts in capital repair times for rotary kilns and coolers, cuts in the work capacity of the job were attained as a result of first assembling shells with reinforced bandages into blocks. Checks were made of the joint sites, control bearings were installed, as well as stops, and we fitted tensioning hooks. The assembly of the parts into blocks avoided handling cumbersome trestles and temporary welded bridges.

The jointing of cylindrical shells when blocks are being assembled presents no difficulty at present since the geometrical dimensions of standardized shells are made with at least class-6 precision, and the face surfaces worked on gas-cutting plant of the carousel type have a deviation from perpendicular to the axis of not more than 0.03 mm on a length of 100 mm around the face periphery, which corresponds to the technical installation specifications.

Assembling the blocks requires slight dressing of the shells to ensure alignment of the block axis, and in this case alignment is done on four braces drawn across the internal surface of the shell. Installation work on the side of the block for the unloading end of the kiln frame with a conical section (Fig. 1) is more complicated since the jointed shells, different in shape and dimensions, should be coaxial to the block axis, and the length of side surfaces thus formed for each of the shells 1-3 should not deviate by more than ±1.5 mm.

In order to align the shells when assembling such a block at equal distances around the periphery perpendicular to the upper face of shell 1, which was selected as the basis plane of the installation, we install four control supports 4 on girder No. 14.

On each support two reference lines at a distance from the basis plane equal to the height of the jointed shells are made, respectively, 2 and 3 + 25-30 mm (for ease of calculation during the alignment). On the supports are stretched two rows of mutually perpendicular braces 5 and 6 (after placing each corresponding shell). After placement of the conical shell, the alignment proceeds and this consists in measuring the distance $\alpha$ from the edge of the upper face to each support (along the brace).

Simultaneously, we measure the distance $h_1$ from each brace to the face of the conical shell. By cutting the lower face of the conical shell we obtain the same distances $h_1$ over the vertical and the same distances $\alpha$ across the horizontal; the maximum deviation of each of these distances should not be more than ±1.5 mm.

Between the aligned conical and cylindrical shells there should be a gap of 2 mm. A root joint is welded at the end of the joint on the outside or inside.

The jointing, alignment, and final installation of the terminal shell are carried out in the same way as the conical, measuring the distance $B$ and the $h_2$ from the second row of braces. The high precision of the mutual arrangement of shells 1-3 ensures correct seating of the refractories, and reliable operation of the rotary kiln when it is functioning.

The method of assembling the shells in blocks, beside high precision, guarantees complete safety of operations; control supports prevent shells 2 and 3 from shifting in placement and alignment.

The improvement of the cooler drive was made using standardized crown gears 1 (Z = 148, m = 24) assembled in the block with shell 2 (Fig. 2). Since the shell is made with a
Fig. 1. Plan showing the alignment and assembly of the unloading end of rotary kiln: 1-3) shells: cylindrical (1), conical (2), end (3); remaining notation explained in text.

Fig. 2. Plan of installation for crown gear on drum cooler.

precision class less than the crown gear, then the assembly of the block was done with the gear based on the assembly. A preliminary measurement with an accuracy of up to 0.5 mm was made of the internal diameter of the gear \( D_B \) and the length of the external periphery of the shell from which the diameter of the shell \( D_0 \) was determined. The required gap \( d \) ensuring coincidence of the axes of shell and gear in installing the block, and also the arrangement of the gear planes perpendicular to the block's axis, were calculated from the equation

\[
d = \frac{D_B - D_0}{2}.
\]

Before installation commences, the internal-angle braces in the shell are demolished to ensure that it is mobile when the assembled crown gears are being placed on cantilever 3, and the lines for placing the cantilever are made at a distance from the placement point under the gear equal to \( H + B/2 \) from the end plane of the shell (\( H \) is determined from the general plan for arranging the drive, taking into account the width of the gear tooth \( B \)). After the gear has been placed on the cantilever, the thrust plates are assembled. The bearings that are welded to the shell are placed in the gap formed between the plates and the shell.

Fig. 3. Drive unit for drum cooler.