2. In working a face with complex structure, $K_f$ must be calculated from the values of the bed coefficient, determined with allowance for the mechanical properties of the rocks composing each bed (it is necessary to determine the technical productivity afresh for each bed).

LITERATURE CITED

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USE OF ROTOR CRUSHERS IN CYCLIC FLOW TECHNOLOGY IN FLUX QUARRIES

B. V. Faddeev and A. I. Sirotkin

The good qualities of rotor crushers — their economy of metal and energy, and their capacity to produce highly crushed products — have resulted in their widespread use in the production of building materials and other branches of the national economy. Recently they have been tried out with cyclic-flow technology (CFT) — the AD-2 with the SMD-87 crushe in the Komsomolskoe Ore Administration, the SD-300 with S-688 crushe and the SDA-1000 with SMD-87 crushe in the Turgoyak Ore Administration. It is proposed that seven other quarries, with a total output of 25.3 million tons per annum, should be converted to CFT with the SDA-1000 and SDA-500 machines [1].

The production of fluxes involves the problem of reducing overcrushing and increasing the yield of commercial (fragment) fractions for the metallurgical industry. The fine fractions (0-10 and 0-25 mm) are of little use for metallurgical purposes, and are largely screened off and thrown away. The intensive crushing of material in rotor crushers requires us to estimate their range of applicability in the production of fluxes; this can be done on the basis of the results of operation of CFT in flux quarries and the present authors' investigations.

The mechanical properties of the limestones under test were as follows:

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density, tons/m$^3$</td>
<td>25-2.7</td>
</tr>
<tr>
<td>Hardness on the Protod'yakonov scale</td>
<td>6-8</td>
</tr>
<tr>
<td>Compressive breaking strength, kg/cm$^2$</td>
<td>750-1450</td>
</tr>
<tr>
<td>Wear in Deval attrition test, %</td>
<td>8.5-10.4</td>
</tr>
<tr>
<td>Dilation factor</td>
<td>1.6</td>
</tr>
</tbody>
</table>

When blasted limestones with approximately identical mechanical properties and fragment sizes corresponding to a weighted-mean fragment diameter of 250-300 mm are mechanically crushed in cone, jaw, and rotor breakers, the crushed products have different fractional composition distributions (Fig. 1). When the limestone was subsequently crushed to commercial fragment size the product was found to have very varied fractional composition (see Table 1). In CFT systems with rotor crushers, commercial fragment sizes of 0-130 and 0-80 mm can be obtained directly after the first stage, by regulating the discharge slit sizes in the crushing chambers and the peripheral velocity of the crusher rotors. However, such high degrees of crushing in breakers of these types are accompanied by a high yield of fines of class 0-25 mm, which constitute 47.6% when the commercial fraction is 0-130 mm (curve 1) and 62.2% when it is 0-80 mm (curve 4). In CFT systems with jaw crushers as the first stage followed by a stage with cone crushers, the yield of the 0-25 mm class in the final product is 38.4% for a fragment size of 0-130 mm and 42.8% for a fragment size of 0.80 mm. The lowest yield of 0-25-mm fines is observed in the cyclic technology (CT) with cone crushers in both stages: it is 33.8% when the end product is 0-80 mm.

The high yield of fines in rotor crushers is due to the specific mechanism of impact-rebound crushing, in which, owing to the multiple impacts and rebounds, two processes occur simultaneously – crushing and grinding; these act on commercial-sized fragments in the blasted rock which do not require further grinding. Crushing in cone and jaw breakers is based on the principle of crushing between breaker jaws with the consequent brittle and plastic deformations. This crushing mechanism is more liable to form fines than breakage by free impact which is the principle used on rotor crushers [2]. However, since the crushing jaws act only once on fragments larger than the discharge slot, and since fragments of commercial size pass through the crusher without being acted on by the crushing pieces, a smaller yield of fines is obtained in the products of cone and jaw crushers. However, fine fragments compressed between the larger fragments and the crushing jaws at the moment of compression are partly overcrushed.

Preliminary screening before crushing reduces the overcrushing of the material, especially in rotor crushers. Curve 3 in Fig. 1 characterizes the fragment-size composition of the product of treating limestones in the SDA-1000 self-propelled crusher, which is fitted with an SMD-87 breaker unit and, unlike the AD-2 and SDA-300 systems, has a preliminary screening unit with an efficiency of 0.6 (a vibrating-grating system). When the product has a fragment size of 0-300 mm, we observe a more uniform distribution of fractional composition: The yield of the 0-25-mm class is only 26.3%. When the limestone is later subjected to final crushing (following the SDA-1000) in the crushing and sorting plant in KKD-900 and Simons 5.5 cone breakers, also preceded by screening stages, the yield of the 0-25 mm fines