

关于全矿区(井)总开采率计算方法的探讨

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摘要 通过比较,指出了现行全矿区(井)总开采回采率计算方法的缺陷,推导出新的全矿区(井)总开采回采率计算方法,并用实例加以验证。

关键词 矿区(井)总开采回采率 计算方法 权数

现行全矿区(井)总开采回采率的统计计算方法是各矿井(坑口)的采出工业矿石量(或统计产量)作权数,采用加权算术平均值计算公式进行计算确定的。笔者用简单的数学方法对比,发现现行计算方法的误差较大,并推导出新的矿区(井)总开采回采率指标统计计算方法。

1 矿区(井)总开采回采率的计算

1.1 常用的平均值计算公式

(1)加权算术平均数(值)计算公式:

$$X = \sum(xf) / \sum f \\ = (x_1 f_1 + x_2 f_2 + \dots + x_n f_n) / (f_1 + f_2 + \dots + f_n) \quad \text{①}$$

式中: f 为算术平均数的权数, X 为总体中各子项的相对数或平均数。

(2)加权调和平均数(值)计算公式:

$$H = \sum m / \sum(m/x) \\ = (m_1 + m_2 + \dots + m_n) / (m_1/x_1 + m_2/x_2 + \dots + m_n/x_n) \quad \text{②}$$

式中: m 为调和平均数的权数, x 为总体中各子项的相对数或平均数。

1.2 开采回采率通用计算公式

$$\text{开采回采率} = \frac{\text{采出工业矿石量}}{\text{应采出工业矿石量}} \times 100\% \quad \text{③}$$

1.3 现行全矿区(井)总开采回采率指标统计计算方法

现行的计算方法是以各矿井(坑口)的采出工业矿石量作权数,采用加权算术平均值计算公式,进行各矿井(坑口)的开采回采率数据的加权算术平均值计算,从而得到全矿区(井)总开采回采率指标。实际工作中,常常用各矿井(或坑口)的统计产量代替采出工业矿石量,进行计算。

计算公式为:

$$K = \sum(kt) / \sum t \\ = (k_1 t_1 + k_2 t_2 + \dots + k_n t_n) / (t_1 + t_2 + \dots + t_n) \quad \text{④}$$

式中: k 为各矿井(或坑口)的开采回采率, t 为各矿井(或坑口)的采出工业矿石量(或统计产量)。

1.4 新的矿区(井)总开采回采率计算方法

(1)用应采出工业矿石量数据作权数,采用算术平均值计算公式,可以确定出全矿区(井)总开采回采率指标。推导如下:

$$K = T/Q \\ = \sum t / \sum q \\ = (t_1 + t_2 + \dots + t_n) / (q_1 + q_2 + \dots + q_n) \\ = (t_1/q_1 \times q_1 + t_2/q_2 \times q_2 + \dots + t_n/q_n \times q_n) / (q_1 + q_2 + \dots + q_n) \\ = (k_1 q_1 + k_2 q_2 + \dots + k_n q_n) / (q_1 + q_2 + \dots + q_n) \\ = \sum(kq) / \sum q \quad \text{⑤}$$

式中: T 为矿区(井)的采出工业矿石量, Q 为矿区(井)的应采出工业矿石量。

(2)用采出工业矿石量数据作权数,采用

加权调和平均数(值)计算公式,可以确定全矿区(井)总开采回采率指标。实际计算中,可以用各矿井(或坑口)的统计量代替 t ,进行计算。推导如下:

$$\begin{aligned} K &= T/Q \\ &= \Sigma t / \Sigma q \\ &= (t_1 + t_2 + \dots + t_n) / (q_1 + q_2 + \dots + q_n) \\ &= (t_1 + t_2 + \dots + t_n) / (q_1/t_1 \times t_1 + q_2/t_2 \times t_2 + \dots + q_n/t_n \times t_n) \\ &= (t_1 + t_2 + \dots + t_n) / (t_1/k_1 + t_2/k_2 + \dots + t_n/k_n) \\ &= \Sigma t / \Sigma (t/k) \dots\dots\dots \textcircled{5} \end{aligned}$$

1.5 现行计算公式与新公式比较

将④与⑤、⑥比较后可得出:以各矿井(坑口)的采出工业矿石量作权数、采用加权算术平均数(值)计算公式计算总开采回采率指标的现行计算方法,误差较大。实际工作中,应根据不同情况,分别采用⑤、⑥进行全矿区(井)总开采回采率指标计算。

2 新计算方法与现行计算方法比较实例

2.1 例1

某矿务局一矿区由一、二、三、四矿4个行政矿组成,各矿的回采率计算数据如表1。

表1 某矿务局开采回采率的有关数据

企业名称	采出工业矿石量(万t)	应采出工业矿石量(万t)	开采回采率(%)
一矿	88.8	138.1	64.3
二矿	117.7	225.9	52.1
三矿	203.6	506.5	40.2
四矿	63.5	90.3	70.3
全矿区	473.6	960.8	49.3

现要求用各行政矿的采出工业矿石量与开采回采率数据计算全矿区的总开采回采率指标。

(1)现行计算方法计算全矿区总开采回采率的计算结果为:

$$K = \frac{64.3\% \times 88.8 + 52.1\% \times 117.7 + 40.2\% \times 203.6 + 70.3\% \times 63.5}{88.8 + 117.7 + 203.6 + 63.5}$$

$$= 51.7\%$$

(2)新计算方法计算全矿区总开采回采率的计算结果为:

$$K = \frac{88.8 + 117.7 + 203.6 + 63.5}{88.8/64.3\% + 117.7/52.1\% + 203.6/40.2\% + 63.5/70.3\%} = 49.3\%$$

表1中的全矿区开采回采率是全矿区的采出工业矿石量与应采出工业矿石量之比。很显然,新计算方法的计算结果比现行计算方法的计算结果准确。

2.2 例2

某矿山企业共有甲、乙、丙三个坑口,在矿产资源补偿费应征周期内,三个坑口的回采率分别为50%、60%、70%,矿石产量分别为10万t、15万t、20万t,求该矿山企业在应征周期内总开采回采率(此例摘自《〈矿产资源补偿费征收管理规定〉条文释解》p26,地质矿产部政策法规司编,1994年,地质出版社。)

(1)现行计算方法计算全矿区总开采回采率的计算结果为:

$$K = \frac{50\% \times 10 + 60\% \times 15 + 70\% \times 20}{10 + 15 + 20} = 62.22\%$$

(2)新计算方法计算全矿区总开采回采率的计算结果为:

$$K = \frac{10 + 15 + 20}{10/50\% + 15/60\% + 20/70\%} = 61.71\%$$

2.3 结论

由例1、2可知,现行的计算方法的计算结果偏高,误差较大。

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英文摘要

ENGLISH ABSTRACT

Several Problems about Mining Industry Administration in China

Li Pengfei

The embodiment of state-owned mineral resources and the evils of dissociation between exploration and mining are discussed. It also analyses the sell of mining right. An opinion about correct understanding of imposing the compensation for the mineral resources is brought forward.

Implement Continued Development Policy and Promoting the Mineral Resources Protection

Guo Tingjie

In view of the confusion in mining exploitation in our country, the paper discusses reasons for the confusion and counter-measures.

Excavating Chart—the Base of Doing Well Township Coal Mine Administration

Zhao Shian

In the light of work practice, the paper inquires into the relation between the mineral resources administration and the excavating chart. The main problems in the chart are pointed out, and their solution measures are brought forward.

On Calculating Methods to Total Mine Recovery

Yin Ming

Defect of the present calculating methods to total mine recovery are pointed out by comparison, and a new calculating method is interred and checked.

Develop Basic Industry upon Superior Mineral Resources

Huang Zhongquan

This paper analyses the superior mineral resources in Yunnan Province, inquires into important fields in local mining industry, and puts forward some advices.

Medical Uses of Plants Enriched Mineral Elements and the Initiation of Agricultural Geology

Yu Jinsheng

The function and important significance of agricultural geology are expounded. A test of transforming inorganic elements in minerals into organic composition absorbable by human body is introduced.

On Sintering Property of Andalusites

Li Jianping et al.

The sintering property of andalusite has been studied with different grain size, burning temperature and raw material ratio. The initial and finished temperature for andalusite decomposition, thermal expansion ratio and mullitization relate to the burning temperature, grain size and impurity content. Andalusites begin to transform into mullites between about 1200~1300°C, and react strongly at 1400°C. At 1500°C the mullitization seems complete.

Processing Test on a Garnet-Sillimanite Ore in Shaanxi Province

Qiu Guangmei

The size of the two minerals in the ore are fine. Under the condition of fine grinding, garnet concentrate can be obtained with a grade of 93% and a recovery of 85% by a appropriate processing circuit, but the sillimanite concentrate is difficult to obtain. Under the condition of coarse grinding, the