PMP *MILL* 13

The Energy Efficiency Curve for Calculating Tumbling Mills

MILL 13 - MODEL FOR TUMBLING MILLS

This module provides qualified methods for evaluating and calculating the comminution and the corresponding energy consumption in tumbling mills.

Of course, **PMP MILL 13** is also equipped with the features to determine the most common characteristic values of the comminution process:

- reduction ratio
- surface growth
- mass related energy consumption
- energy efficiency

A multitude of planning- and optimisation calculations for grinding systems with tumbling mills can be performed by means of the new energy efficiency curve Winv(x) being available with **PMP MILL 13**.

WHAT IS THE ENERGY EFFICIENCY CURVE ?

The energy characteristic Winv(x) is a characteristic curve, which values represent a material specific energy amount required for comminution at a corresponding particle size. Winv(x) forms the core of the module **PMP MILL 13**. Its individual values with respect to a considered particle size are the so called energy invariants. They can be compared by all means with the well known work index of Bond. However, distinguished from the Bond approach, which only supplies the d80 particle size of the comminution result, the energy efficiency curve supports the calculation of complete particle size distributions. This fact also applies for employing the BOND approach instead of relations of RITTINGER or KICK respectively.

HOW TO DETERMINE THE ENERGY EFFICIENCY CURVE?

Winv(x) can be determined using the technical data of the tumbling mill, mill throughput and particle size distributions of mill feed and mill discharge at an operating point being representative for the evaluation of the mill behaviour.

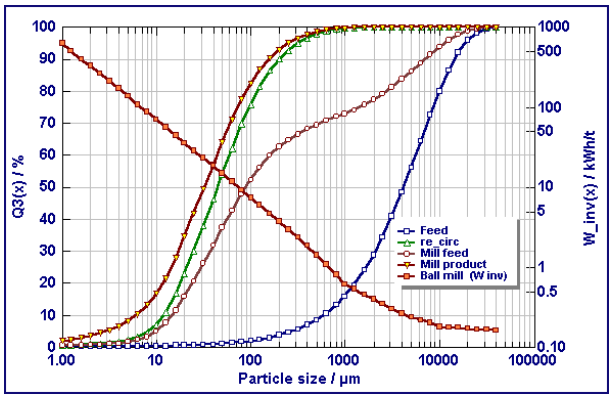


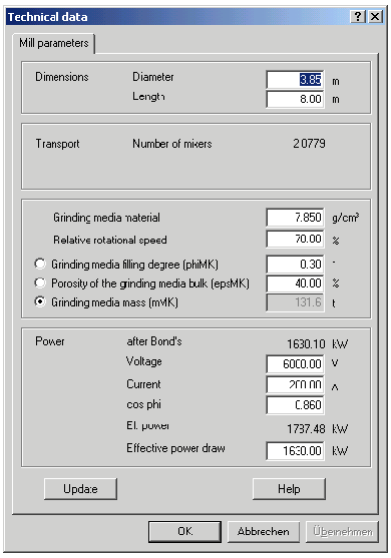
Fig.1: Tumbling mill in a grinding circuit

The PMP diagram on the lower left side, reflects typical conditions for determining the Winv(x) of a tumbling mill inside a closed grinding circuit: The entire mill feed which cannot be sampled has been balanced from the plant feed and the feedback material. The resulting energy efficiency curve is represented by a descending straight line in a log/log grid. That is a power function with respect to the linear scale with a characteristic exponent < 0.

WHICH VARIABLES ARE CONSIDERED ?

The comminution result can be predicted safely for a material, which energy efficiency curve had prior been determined by means of **PMP MILL 13**. The following variables need to be considered explicitly

- mill size
- mill rotational speed
- grinding media filling degree
- effective power of mill
- mill throughput
- mill feed size distribution



The PMP dialogue "Technical Data of Tumbling Mill" acts as dispatcher in order to realise the required assignments and conversions.

MILL 13 - APPLICATION BENEFITS

PMP MILL 13 is a **reliable decision guidance** for optimising the application of tumbling mills as comminution stages in open or closed grinding circuits.

PMP MILL 13 as a **valuable scale up tool** supports the batch test grinding results to predict the industrial mill behaviour within an arbitrary grinding plant.

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