REPRESENTATIVE SAMPLING SYSTEMS

FOR BULK MATERIALS

transported on conveyor belts

M&W JAWO HANDLING

THE MARK & WEDELL SAMPLING SYSTEMS

Knowledge of the properties of bulk material:

- Content of prime property
- Moisture content
- Hardness
- Content of minerals
- Content of contamination
- Size distribution
- And many other properties

are essential when controlling the quality of the material.

The properties are identified by taking statistically representative samples from each batch of material.

The Mark & Wedell Sampling System is an integrated part of the control system available to the operators.

The Sampling System provides the operator with the means for executing the extraction and preparation of representative samples of the material.

The sample size is suitable for making laboratory analysis.

The Mark & Wedell Sampling Systems operate in accordance with approved international standards.

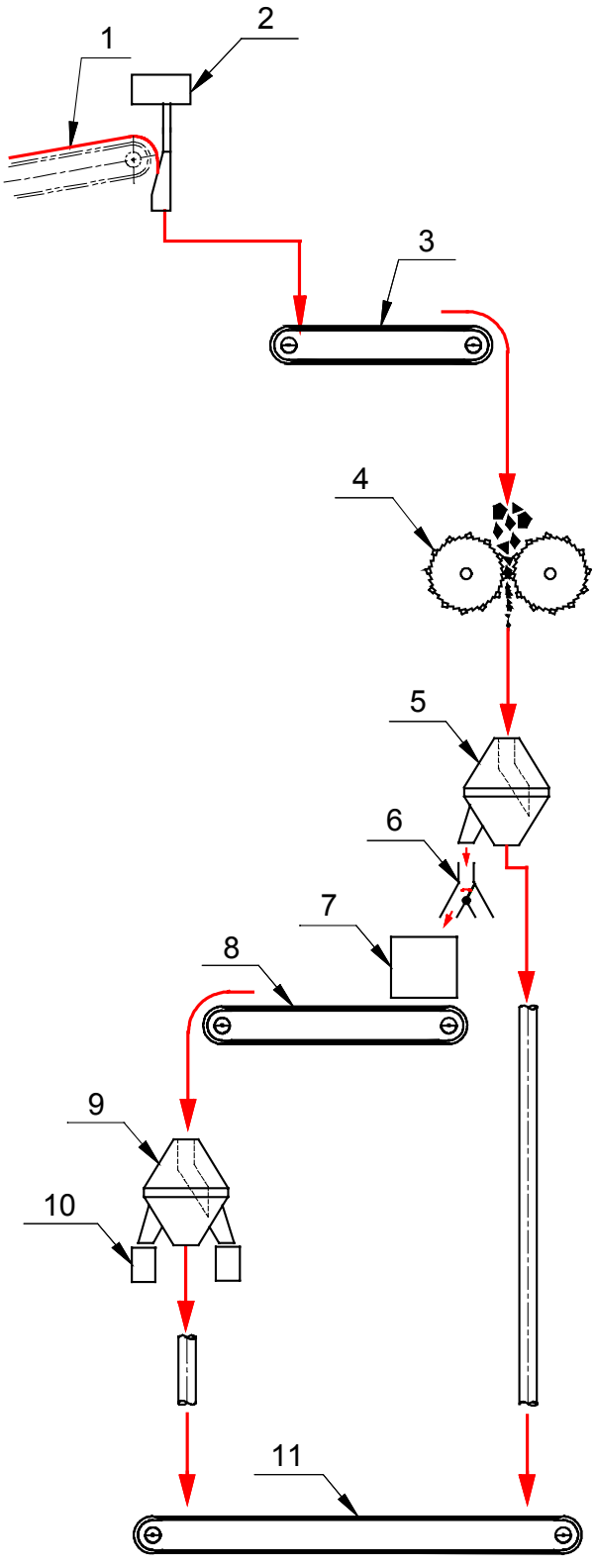
The results of the laboratory tests performed on the basis of the representative samples prepared by the sampling system are used for:

- Calculating the value or payment due for each batch of material supplied.
- Adjusting down stream production.
- Calculating the amount of by-products from each batch.
- Calculating the pollution from each
- Calculating the blending of various material batches to obtain maximum end product.

DIAGRAM LEGEND:

1.Conveyor
2.Cross belt bucket sampler
3.Feeding belt
4.Chrusher
5.Rotary tube divider
6.Bias valve
7.Buffer container
8.Feeding belt
9.Rotary tube divider
10.Sample bottles
11.Reject material conveyor

TYPICAL SAMPLING SYSTEM PROCESS DIAGRAM



SAMPLING SCHEDULE:

In order to verify the material properties for a given material lot it is necessary to take out a number u of sampling units. This number depends on the mass of the lot and on the desired overall sampling precision. Minimum requirements are listed in Table 1.

Each sampling unit is taken by the sampling equipment as n increments, where n should be 10 or more.

The properties of the materal lot can be determined with an overall precision P_L using equation 1 where:

- V_{PT} is variance of sample preparation and test. If no data available: assume 0.2
- V_I is the variance of primary increment. If no data available: assume 20

The overall precision is a function of the number of sampling units u, the variance of sample preparation and test V_{PT}, the number of increments n and the variance of the increments V_I.

If a given precision P_L is required the number of increments n and the number of sampling units u can be found using Equation 2 and 3 respectively.

The values n and u are adjusted upwards and recalculated to a convenient combination respecting the required minimum values.

Mass of Lot tonnes	No. of sampling units
< 5.000	1
5.001 – 20.000	2
20.001 – 45.000	3
45.001 – 80.000	4
80.001 – 125.000	5
125.001 – 180.000	6
180.001 – 245.000	7

TABLE 1

$$P_L = \pm 2 \frac{\frac{V_I}{n} + V_{PT}}{u}$$

EQUATION 1

$$n = \frac{4V_I}{uP_L^2 - 4V_{PT}}$$

EQUATION 2

$$u = \frac{4V_I + 4n_1V_{PT}}{n_1P_L^2}$$

EQUATION 3

EQUIPMENT SIZING CONSIDERATIONS:

The mass of each primary increment can be calculated using Equation 4 where:

- C is flow rate [t/h] on conveyor belt.
- A is cutting aperture [mm].
  Should be / 3 times the nominal top size of material.
- S is cutter speed [m/s].

$$m = \frac{C \cdot A}{3{,}6 \cdot S} \cdot 10^{-3}[kg]$$

EQUATION 4

If S is constant the incremental mass is a function of the flow rate C, the nominal top size of the lumps and cutting aperture A.

As a guideline for lay-out of sampling systems the reference increment mass from Table 2 should be used as minimum values.

The total mass of the sample (sampling unit) is at least n times the increment mass where n is at least 10 as previously discussed.

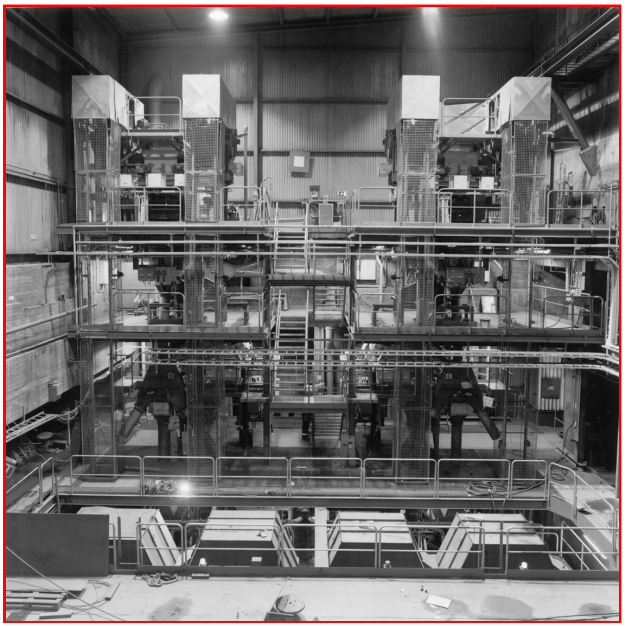
Nominal top size mm	Reference incr. Mass Kg
300	100
200	25
150	15
125	10
90	5
63	3
45	2
31,5	1
22,4	0,75
16,0	0,50
11,2	0,25
8,0	0,15

TABLE 2

SAMPLE DIVISION:

To obtain convenient sample masses, the sample is divided into a number of statistically identical but smaller samples and a rest which is returned to the conveyor.

From the preceeding section is seen, that reducing the mass needs a reduction in particle size is required in order to preserve the representative nature of the sample. For this reason a system for extraction of representative samples of materials consists of multistage extraction, particle reduction and division equipment.



The Company and its product line

M&W is an internationally working engineering company specialized in the design, manufacturing and supply of sampling systems for all type of bulk materials for quality control, optimising processes and controlling by-products in installations world-wide.

M&W 's product line

- **Sampling Systems**
- **Modular Sampling Systems**
- **Samplers**
- **Dividers**
- **Crushers Automatic Dust Sampler**
- **Accessories**

M&W JAWO HANDLING A/S

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