PROPAT
INTEGRATED PROCESS CONTROL

Mineral and metallic powders milling process control with ProPAt technologies

Online Grain Size measurement and closed-loop control of the milling parameters (GM, MBN)

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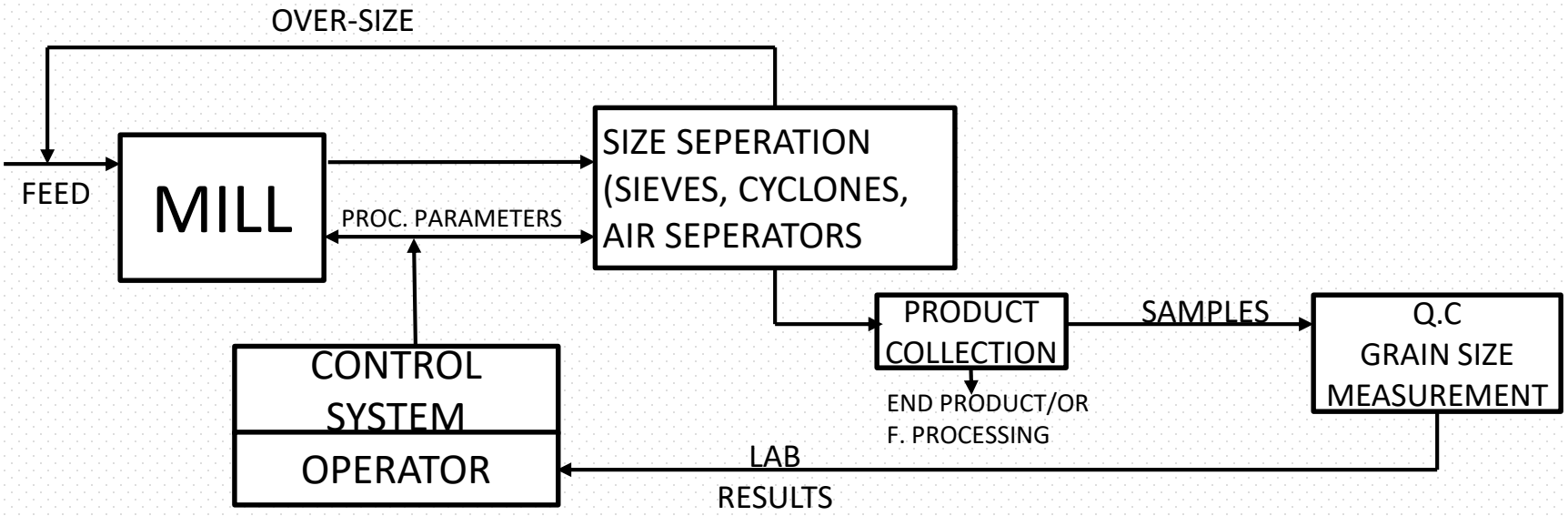
SIZE REDUCTION : CRUSHING and MILLING

Definition: size reduction is the operation carries out for reducing the size of bigger particles into smaller one of **desired size and shape**.

Size reduction or comminution of bulk solids is a very common and important unit operation found across many process industries and for many reasons:

- To improve performance: chemical activity, bioavailability, dispresion...
- To improve handling: transport, storage, dosing...
- For efficient liberation of key species (ores)
- Homogenecity of multi compound systems: ceramics, cement...

SIZE REDUCTION / MILLING PROCESS
ACTUAL SITUATION



Desired size: Grain size measurements

Milling process parameters control and adjustment

GRAIN SIZE IMPORTANCE AND MAIN GOALS

- Grain size affects a certain number of important properties of powders.
  - ◊ Rheological properties:
    - ❖ Angle or repose
    - ❖ Flow rate
    - ❖ Loose and tap density
  - ◊ Absorption: viscosity ofslurries
  - ◊ Dispersion: multicompound powders
  - ◊ Reactivity:
    - ❖ Reactive surface
    - ❖ Surface properties
  - → Desirable and stable Grain size (Granylometry)

- Main goals and aim of the ProPAT Project.
  - ◊ Fast milling parameters adjustement to obtain the desired granulometry with mínimum lost production.
  - ◊ Continuous process control to maintain desired granulometry to evoid out of specs
  - → Continuous online grain size measurement and automatic process control

GRECIAN MAGNESITE-PRODUCTS AND REQUIREMENTS

- PRODUCTS: Magnesium oxide (MgO), Magnesium Carbonate ($MgCO_3$).
  2015 production: -MgO 6.856 ton
  - $MgCO_3$ 6.292 ton

- For both products the particle size distribution (PSD) is strictly correlated with the product's performance in most applications.

- Grain Size Ranges (as d_{98}): -45µm, -75µm, -100µm, -150µm.

- Required performance of the ProPAT PS Sensor
  – In most applications the knowledge of d_{98} and d_{50} is required to define the PSD.
  – In many applications the knowledge of whole PSD pattern is required.
  – In some cases only the d_{98} is required.

- ProPAT PS Sensor Integration in the Milling Process.
  – Efficient and accurate measurement of d_{98} and d_{50}.
  – Monitoring and fast adjustment of milling parameters to minimise wast and out of spec products.

→ **INTERGRATED PROCESS CONTROL**

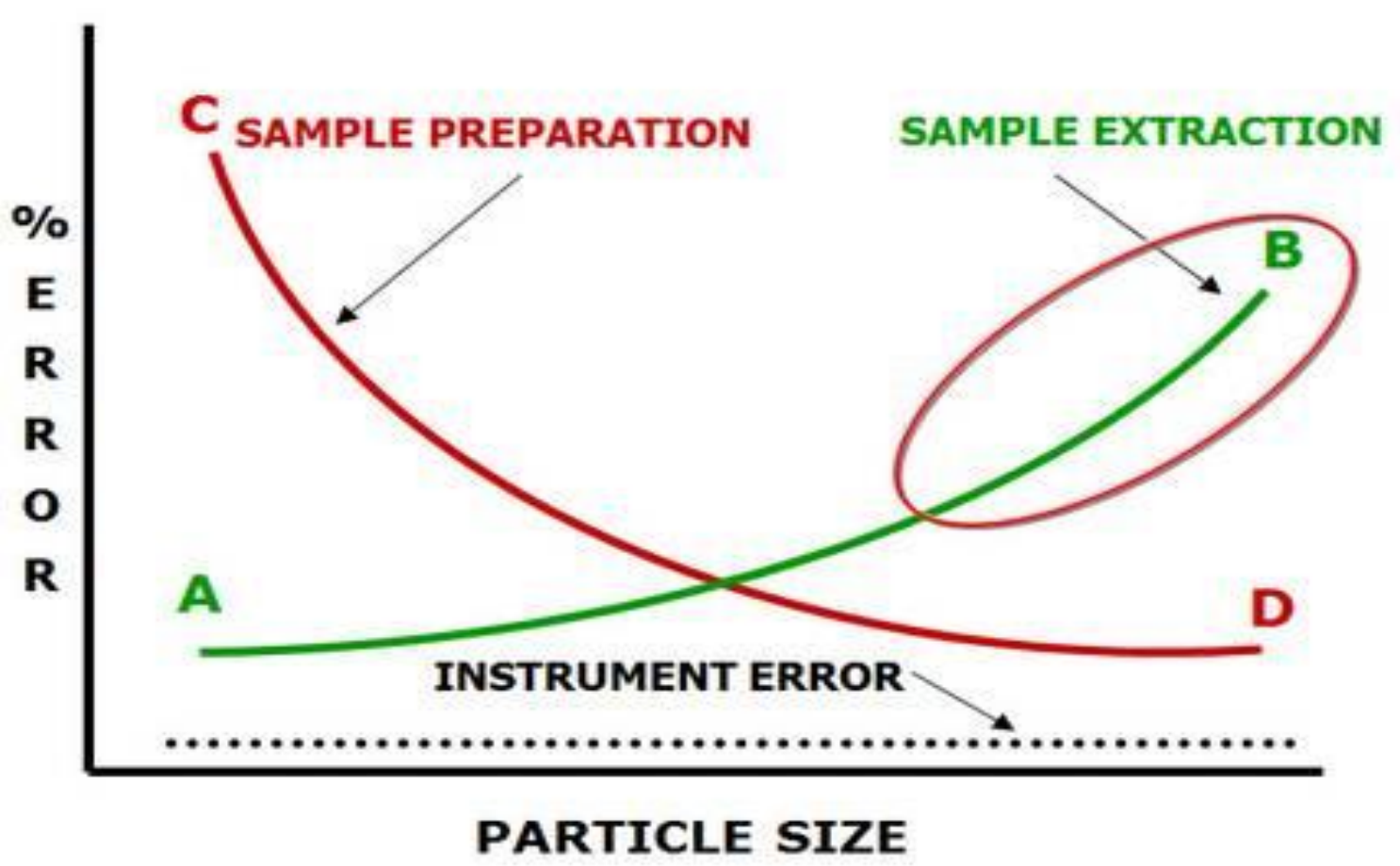
INTERGRATION OF THE ProPAT TECHNOLOGIES
ProG GRANULOMETER

MAIN CHALLENGE: Successful integration of the ProG granulometer for fast, accurate and reliable grain size measurements

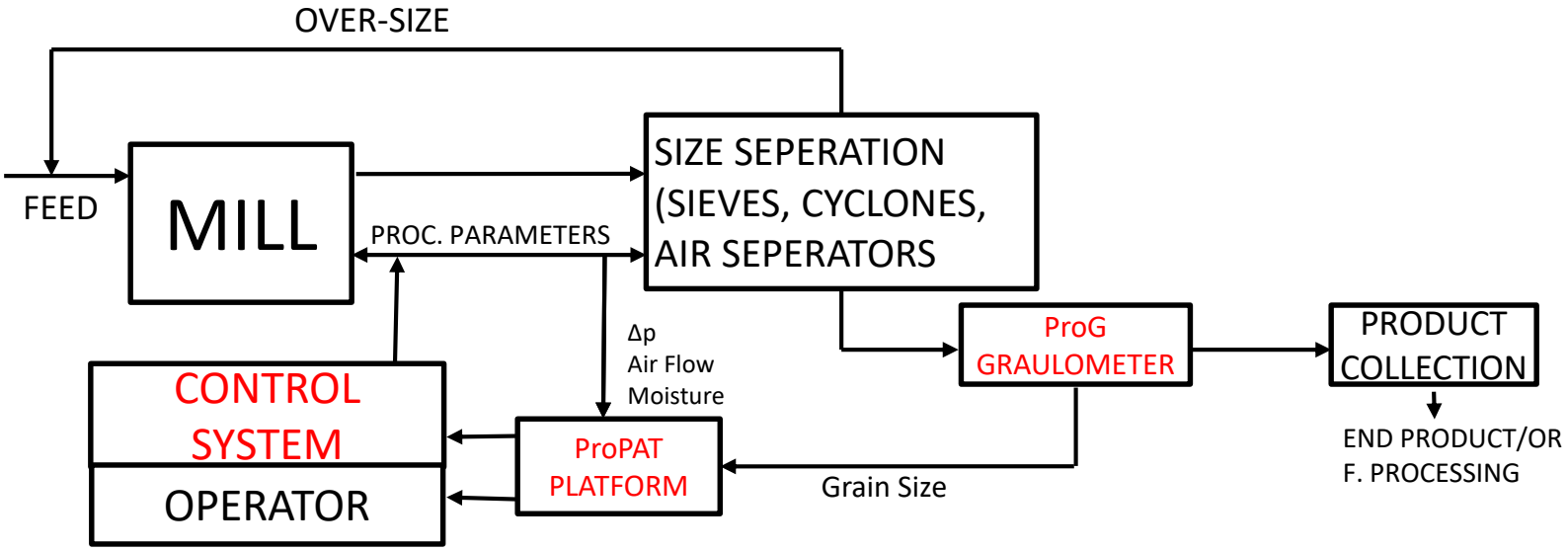
- SAMPLING: Representative and reliable samples
- SAMPLE PREPARATION: +Good Dispersion
  +Dispersions with the required concentration range

ERRORS IN PARTICLE SIZE MEASUREMENT

The Importance of Sampling & Dispersion



SIZE REDUCTION /MILLING PROCESS WITH ProPAT INTEGRATED CONTROL



- CONTINUOUS GRAIN SIZE MEASUREMENT.
- CLOSED LOOP PROCESS CONTROL

Goals to achieve in the project

- Continuous, accurate and reliable grain size measurements.
- Automatic Milling process control.

Expected Benefits

- Higher quality level
- Increased productivity.
- Reduce wastes and out of specs.
- Cost saving

SPIRE 1 - 2014 Integrated Process Control
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Sustainable Process Industry through Resource and Energy Efficiency

Thank you for your attention !

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Partners