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Consulting & Laboratory Services

Expanded Perlte Tests - The Attrition Case

PI Annual Meeting Sept. 14th – 15th 2021

Perlite Institute
Associate member

The path to Profitability – Quantification of Industrial Minerals' "Value"

The value of an industrial mineral in most of the cases is strongly dependent on the final application.

A simple specification may not describe the behavior/suitability of the raw material

⇒ **Specifications based on application tests:**

- not just physical and/or chemical properties

⇒ **Value-to-Client Analysis**

- Process simulation – Quantify the influence of each key parameter

Example of services to maximize Value - Expanded perlite Attrition Tests

- ***Smart Lab techniques for evaluation of various perlite qualities***
  - *various grades expansion,*
  - *testing methodologies – screening criteria*
  - *Evaluation of application properties – comparison with competition*

- ***Why Attrition test of expanded perlite***
  - *Production and Supply chain deterioration phenomena*
  - *Qualitative and Quantitative effect of attrition on the final product/use*

The Design of a new Working Instruction (I)

- Step 1: Design the methodology
- Step 2: Choose instrumentation
- Step 3: Define /Optimize parameters (quantities / time / measured output)
- Step 4: Round Robin Tests – Evaluation of repeatability & reproducibility

The Design of a new Working Instruction (II)

Step 1: Methodology

Attrition testing =

- Rotation of the aggregate in a drum with or without balls
- Mixing in mixers with special paddles

Step 2: Instrumentation

- Los Angeles (suitable for hard aggregates)
- Deval Attrition Tester (requires increased volumes)
- "In-house" rotating drum

- **<u>Micro-Deval (ideal for lab use)</u>**
  - ✓ Standardized test conditions: Test volume, rotation speed

  ⇒ Contributes to repeatability & reproducibility

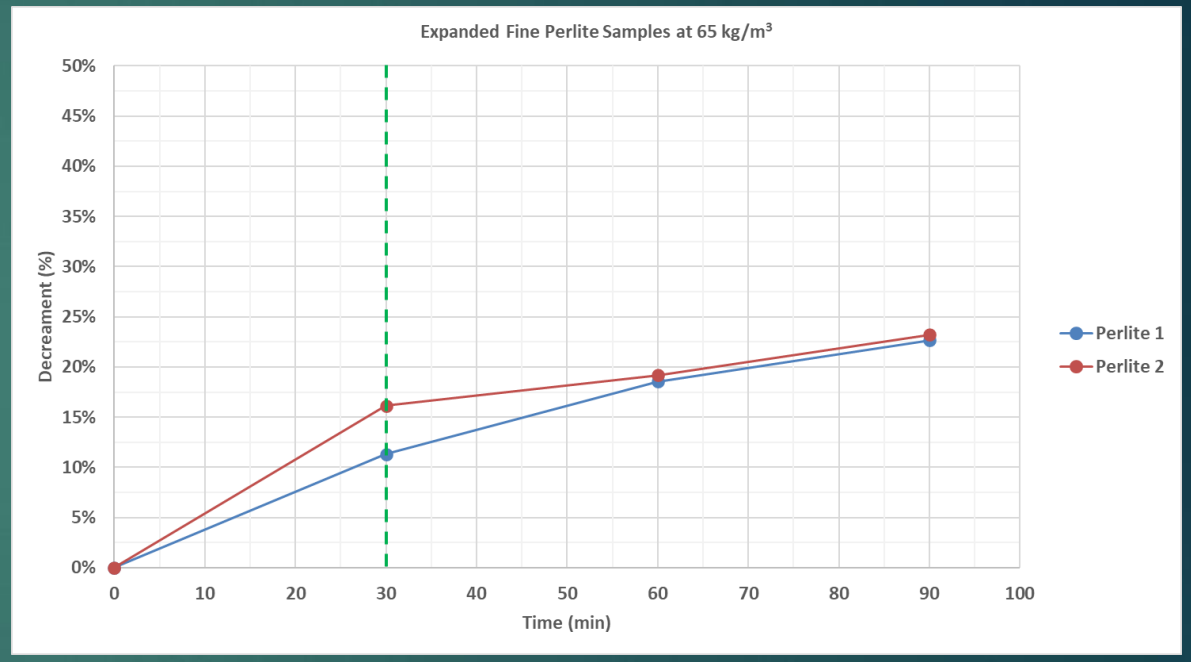
The Design of a new Working Instruction (III)

Step 3: Define parameters

- ✓ **Output: % Volume decrement (easy, quick, directly related to industrial info)**

  PSD change (time consuming)

- ✓ **Input:** Specific initial volume
- ✓ **Rotation:** Time – Number of rotations (Micro-Deval:100 rpm)



Optimize Volume + Time → Make any samples' differences evident

The Design of a new Working Instruction (III)

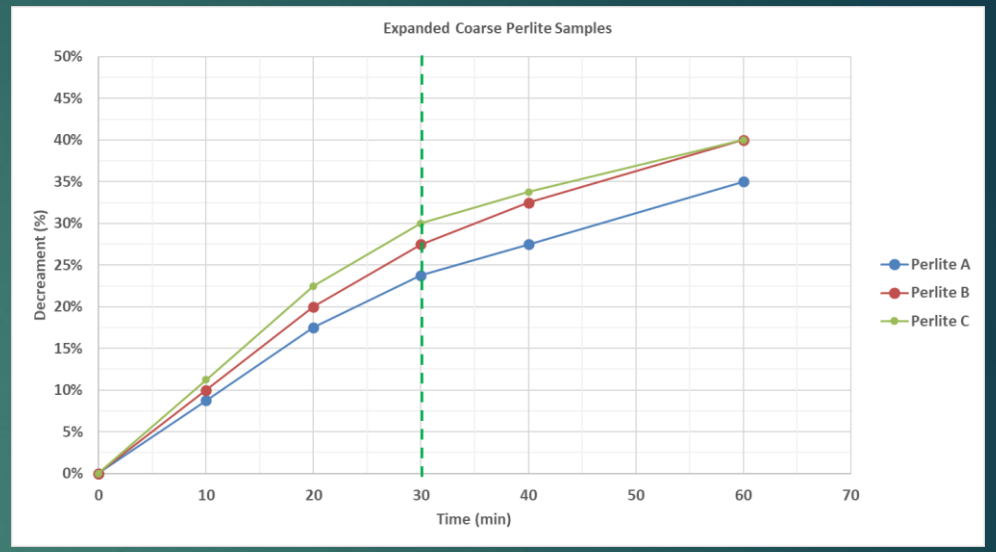
Step 3: Optimize parameters

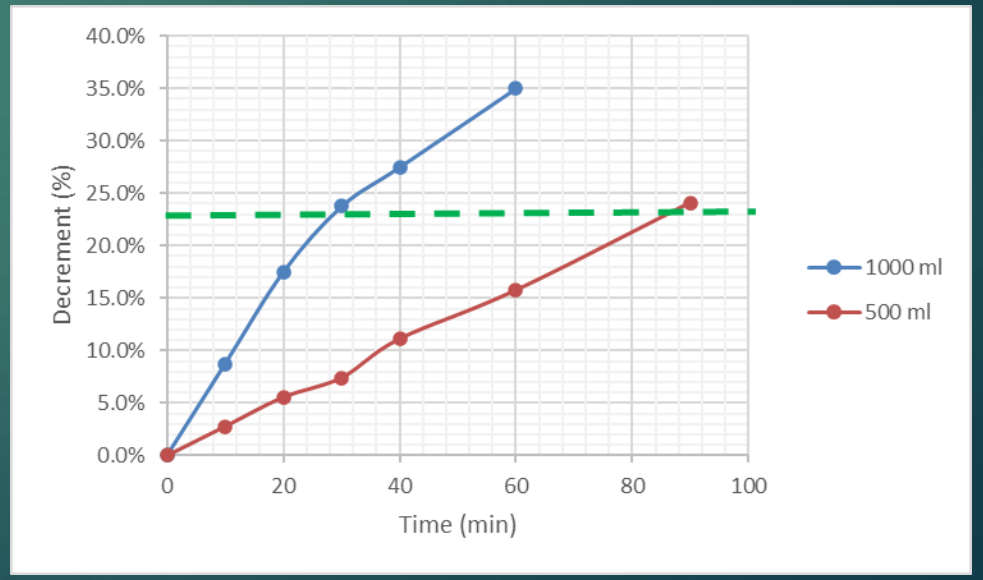
- ✓ **Testing time: 30min**
- ✓ **Input Volume:** 1000 ml

Final Procedure:

Rotation of 1000 ml in Micro-Deval Device for 30 min.

Report Attrition Resistance as %vol. decrement





The Design of a new Working Instruction (III)

Step 4: Evaluation of Repeatability & Reproducibility

- **Repeatability / Reproducibility**
  - Fines expanded at 60 – 70 kg/m^3: 13.5 ± 2.5% (CL 90%)
  - Medium expanded at 90 – 95 kg/m^3: 15.5 ± 1.9% (CL 90%)
  - Coarse expanded at 95 -100 kg/m^3: 24.5 ± 0.45% (CL 90%)

- **Round Robin Tests**
  - We are always willing to participate and collaborate in such projects

Thank you for your attention

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