UNIVERSITY OF KWAZULU-NATAL	*Standard Operating Procedure* PRG pollution research group	**Effective Date:** 12 February 2014	**Version:** ***005***
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SOP_MP_03 Mechanical Properties_ Stickiness Test			Page #: ***1 of 3***

Standard Operation Procedure – Stickiness test for Faecal Sludge

1. Scope and Application

- Stickiness is the property of a substance to stick or adhere onto a surface.
- The "mixing test" is used to observe and evaluate the sticking behaviour of Faecal Sludge samples during the mixing process in a mortar mixer.

2. Apparatus

- A Kenwood kitchen machine with a mixing paddle (Figure 1).

Figure 1: Kenwood Mixer

3. Sampling

- All ingredients (faecal sludge, water and conditioners) are poured together into the mixing bowl and mixed together.

To use the Mixer

- Turn the head lift lever clockwise and raise the mixer head until it locks.
- Ensure the bowl-seating pad is correctly fitted with the K symbol uppermost.

- Push the mixer up the mixer head until it stops and then turn.
- Fit the bowl into the base– press down and turn clockwise.
- Lift the mixer head slightly then turn the head-lift lever anticlockwise and lower the mixer head until it locks.
- Switch on by turning the speed switch to the desired setting.
- Switch to pulse (P) for short bursts.
- Switch off and unplug after use.

4. Safety Precautions

General laboratory safety rules

- Always use safety goggles, gloves and laboratory coat while working in laboratory.
- Protective gloves should be used while handling samples or standards.
- Dispose the used gloves after completion of analysis.
- Clean hands using antiseptic soap.
- Disinfect hands after washing with soap.
- Avoid spillage and contact with skin. In the latter case use copious washings with cold water and call for medical attention.

Kenwood kitchen machine safety rules

- Switch off and unplug before fitting or removing tools/attachments, after use and before cleaning.
- Keep your fingers away from moving parts or fitted attachments.
- Never leave machine unattended.
- Never operate the mixer with the head in the raised position.
- Never let the power unit, cord or plug get wet.
- Take care when lifting this appliance as it is heavy.
- Ensure the head is locked and that the bowl, tools, outlet covers and cord are secured before lifting.

5. Procedure

- Weigh the clean, dry mixing tool and clean, dry mixing bowl.
- Add approximately 2 Kg faecal sludge ("G_{TOT}") to the mixing bowl.
- Rest the mixing tool in the bowl containing simulant, and weigh the bowl. Calculate the mass of simulant (GTOT) by subtracting mass of clean dry tool and bowl.
- Mix at 100 rpm for 3 min until a homogeneous mixture can be ensured (Clearly, this preparation procedure cannot ensure a totally uniform distribution of water at the particle scale; nevertheless it has been observed that this time period is sufficient to achieve mixture homogeneity.
- Remove the mixing tool and weigh the mass of the mixing tool and simulant stuck to it. Calculate the mass of simulant on tool (GMT) by subtracting mass of clean dry tool.
- Calculate empirical stickiness for that water content: $\lambda = GMT/GTOT$.
- Take a water content sample for that simulant.

6. Calculation

The empirical stickiness for that water content is $\lambda = G_{MT}/G_{TOT}$

- G_{MT} is the faeces sticking to the mixing tool.
- G_{TOT} the total weight of faeces in the mixer.

7. References

1. Zumsteg, R., & Puzrin, A. M. (2012). Stickiness and adhesion of conditioned clay pastes. Tunnelling and Underground Space Technology, 31, 86-96.

APPROVAL OF STANDARD OPERATING PROCEDURE

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