STANDARD OPERATING PROCEDURE

Sieve Shaker

Model: Ro-Tap Test
Manufacturer: W.S. Tyler Industrial Group
Location: Wet Processing Pilot Plant, 1851 Food Sciences Building
Publication Date: 04/29/2015
Description and Uses

W.S. Tyler developed the Ro-Tap Test Sieve Shaker in the early 1900s. Until that time, sieving was primarily performed by hand. Today, the Ro-Tap Test Sieve Shaker is used to measure particle-size distribution. The design intent was to replicate and mechanize sieving hand motions. The Ro-Tap Test Sieve Shaker, with its rotating movement and tapping energy, provides for the most consistent, repeatable sieving analysis results. The Ro-Tap is the required test sieve shaker in many industrial specifications. Currently, there are no industry standards governing the calibration of the unit itself. W.S. Tyler recommends the product users develop their own quality control program.

Power Specifications

Motor: Dayton Split-Phase
Power: 1/3 HP
Voltage/Amperage: 115V/6A
Speed/Frequency: 1725 maximum RPM @ 60 Hz.

Note: The included Operating Instructions provide a description of the instrument, a listing of parts, and an “exploded” parts diagram showing all of its components. Consult the instructions for this information.

Potential Hazards and Safety Precautions

Standard Voltage/Possible Electric Shock (115 V)

• Make sure that the wall outlet receptacle is properly wired and grounded, and matches the instrument’s power cord and plug.

• Make sure the area around the outlet, floor and your hands are completely dry when plugging or unplugging the electrical cord to/from the outlet.

Explosion and/or Fire Hazard/Possible Burns

• Do not use the shaker with materials capable of developing flammable or explosive vapors.

• Do not use the instrument near open flames or devices that can generate sparks.

• Depending on the material being sieved, operation may involve occasional generation of fine dust particles which can pose a fire or explosion hazard.

Moving Parts/Entanglement of Extremities, Hair, Jewelry or Clothing

• Make sure to secure long hair and any loose clothing or jewelry before operating the machine.

• Keep hands, arms, and extremities away from all moving parts at all times.

• Use only clamps, sieving screens and other accessories specifically designed for this shaker.
**Flying Debris/Potential Eye Damage**

- Always use proper personal protective equipment at all times while operating the sieve shaker.

**Biological Hazard/Possible Damage to Respiratory and Lung Tissues**

- Depending on the material being sieved, operation may involve occasional generation of fine dust particles which may pose an inhalation hazard. If so, it is recommended that the user wear an approved dust mask.

**Loud Noise Producer/Possible Hearing Loss**

- Always wear protective hearing (ear) protection when operating the Ro-Tap Test Sieve Shaker.

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**Required Personal Protective Equipment**

- Safety Glasses/Goggles
- Protective Footwear (No Open-toed Shoes)
- Lab Coat
- Hair Net (Tie Back Long Hair)
- Gloves
- Hearing (Ear) Protection
- Dust Mask
- No Loose Fitting Clothing

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**Training**

**Required Training**

*Denotes courses offered online*

- Fire Safety & Extinguisher Training*
- Laboratory Safety: Core Concepts*
- Machine & Site Specific Training

**Recommended Training for Frequent Users**

*Denotes courses offered online*

- Laboratory Safety: Spill Procedures
- Shop Safety Fundamentals: Basic Procedures & Policies*
Operation

1. The included Operating Instructions provide a more complete description of the Ro-Tap Test Sieve Shaker and its proper operation. Be sure to read the instructions before operating the shaker to become familiar with its correct operation and individual component parts. Refer to Figure 1 and the parts diagram (Figure 3) as necessary when assembling the Ro-Tap for use.

2. The Ro-Tap has a capacity of six “full-height” sieves and a “full-height” bottom pan, or 13 “half-height” sieves and a “half-height” bottom pan. Select and arrange the sieves in the order to be used for sieving, with the coarsest sieve at the top, and the finest sieve at the bottom. Position the bottom pan below the lowest sieve.

3. Add the sample into the top sieve. Then, cover the top sieve with a brass sieve cover, followed by the cast-iron screen cover (fitted with a rubber stopper, see Figures 3 and 4).

4. Raise the hammer and upper carrying plate latch to the upright position (see Figure 1). Then, insert the stack of sieve onto the sieve supporting plate. Note: The stack should rest firmly against the plate ridge in the back and against the small latch in the front; the cast-iron cap should barely touch the carrying plate on top. If not, you will need to loosen the two bolts on the adjustable plate support and raise or lower the support accordingly. Once the sieve stack and cover is in the correct position, retighten the bolts on the adjustable plate support. You may also need to tighten the two nuts on the Carrying Plate so that the Cover can be rotated freely. This leaves the sieve stack loose enough to rotate freely within the Supporting Plate when the Ro-Tap is operating.

5. Lower the upper carrying plate latch. Then, lower the hammer. The Ro-Tap is now ready for use.

6. The Ro-Tap is equipped with a Gra-Lab universal timer (see Figure 2). The power cord of the Ro-Tap’s motor should be plugged into the timer. Similarly, the timer’s power cord should be plugged into a 115-volt wall outlet. If not, safely do so. Note: Make sure the area around the outlet, floor and your hands are completely dry when plugging or unplugging the electrical cord to/from the outlet.
7. Turning the timer’s pointer clockwise closes an electrical circuit and starts the Ro-Tap (with this, loud hammering and shaking will begin). **Note: Be sure to wear proper hearing protection.** Turn the pointer to the desired number of minutes for the sieving cycle. At the end of the timing cycle, the Ro-Tap will stop hammering and shaking, and the desired sieving time will end.

8. At the end of the sieving cycle, lift the hammer and upper carrying plate latch to the upright position. Then, depress the front latch on the sieve supporting plate and carefully remove the sieves from the Ro-Tap test sieve shaker.

9. Carefully remove the cast-iron and brass sieve covers. Then, recover the material collected on each of the chosen screens.

**Clean-up Procedures**

1. In your laboratory, carefully clean the screens with delicate soap and water. Note: The sieves are costly, so do not apply great pressure to the surface of finer screens, as the screens may rip or tear.

2. Rinse well (first with tap water, then with distilled water) and allow the sieves to air dry on a drying rack.

3. Return to the Ro-Tap and clean up any dust and/or debris in and around the sieve shaker.

4. Carefully and safely unplug all power cords.

5. Have the Ro-Tap test sieve shaker and the surrounding work area inspected by the pilot plant manager prior to departing.

**Machine Care and Maintenance**

- Inspect the machine after every use for any broken parts. Report any broken parts or operational difficulties to the pilot plant manager, who performs all final inspections.

- Lubrication is important in keeping the Ro-Tap sieve shaker running smoothly. Regular lubrication of moving parts should be conducted by the pilot plant manager or a trained service technician.

**Accessories**

Cast-iron sieve cap (with rubber stopper) and Gra-Lab universal timer.
OPERATING INSTRUCTIONS
FOR
RO-TAP TESTING SIEVE SHAKER - SERIAL NO. 13436 & UP
(See illustration drawing 3–K–243, and parts list drawing 2–K–252 attached)

RO-TAP TESTING SIEVE SHAKER

Drawing 3–K–243 attached shows the bolt hole mounting dimensions the legs being drilled for 3/8" dia. bolts. If possible, bolt the unit to a solid concrete foundation or a heavy steel bench. To decrease any vibration, rubber pads can be inserted under each of the three legs. An adjustable leg is provided to relieve the load under the motor shelf. This is identified as Part L–129.

Pour through hole in cover plate of Ro-Tap, the 3½ gallons of S. A. E. # 20 Oil. An oil level of between 2–1/2" and 3–1/4" deep at the filler plug should be maintained. Too much oil will cause leakage at the oil seal. The unit should be drained and refilled with fresh oil every six months.

Oil sparingly Item #40 Hammer Standard Bushing and the Item #38 Hammer Pin. An occasional drop of oil on the motor bearings will be sufficient. Seven Alemite connections are provided for greasing which should be done every three or four weeks depending on the use.

WARNING: Before starting the motor, block the Item #44 Push Rod (which lifts the hammer) in its highest position as damage will result if motor starts in the wrong direction. The Item #68 Main Driving Shaft at the side where it enters the base should run in a clock-wise direction. If motor rotates in wrong direction, the instruction sheet attached to the motor explains how this can be changed. After you are certain the shaft runs in a clockwise direction, release the push rod.

TYLER TIMER

The Tyler Timer is an automatic switch which stops the Ro-Tap at the end of a predetermined period without requiring the attention of the operator. The timer is provided with a cord and plug which is to be connected in the power line. The cord from the motor is then plugged into the Timer plug.

To start the Ro-Tap in operation, turn the pointer of the timer clockwise five points until the circuit closes and the Ro-Tap starts; then turn the pointer forward or backward to the numeral indicating the number of minutes the test is to be run. The Ro-Tap will run the exact length of time required and the Timer will automatically break the circuit and stop the machine at the end of this period.

It is not necessary to disconnect the Timer when the test is completed as it is ready for immediate use whenever the Ro-Tap is to be operated.
SIZE OF SAMPLE AND TIME FOR MAKING TEST

The size of the samples to be used is governed by a number of factors, some of which are:

(a) Accuracy required in test.
(b) Size of opening in sieve, whether large or small. For large openings to provide the necessary number of particles to give an average, larger quantities of material must be used. Fifty grams is the prescribed quantity to be used in making a cement test.
(c) Behavior and character of material.
(d) Accuracy of balance or weighing device.
(e) Reliability of sample tested.

In reporting sieve tests, tenths of a percent is the limit of accuracy justified, except in very unusual cases.

For tests on the 200 mesh sieves or where the 200 mesh sieve is used as one of the series, the amount of material used should be such that not more than 50 grams of sample will remain on this sieve. Samples of this quantity are recommended in testing washed sands or graded sands, where little fine or coarse material is present and a large percentage is retained on sieves 28 mesh (0.0232” opening) or finer. Overloading sieves will give less reliable results.

Near-mesh particles (those which will or will not pass sieve openings) are difficult to handle. To obtain good results with such materials, sieves must be lightly loaded so that each particle is presented many times to sieve openings for classification.

For many plant control operations, three-minute tests on free-sieving materials are sufficient. On more difficult materials, sieving to a period of ten minutes may be justified.

If tests are made to determine if a material meets specifications, a longer period of sieving may be established. All interested parties should agree on and follow a standardized method.

Samples must be representative, otherwise information obtained in sieve tests may prove misleading. To make sure that samples are representative – use the Sample Splitter or Reducer.

With one of these devices, duplicate samples can be accurately cut out and a series of comparative tests can be made to determine a suitable weight of sample and the time required for making the test. If duplicate samples are used and results on the finest sieve check to a half of one percent or to an agreed accuracy, the time for making the test and the size of the sample can be established by this method. Once a routine is established, it should be followed closely.
Drying Samples

If fine particles adhere to coarse particles in drying the sample, a combination of wet and dry test may be necessary. If a wet and dry test is used, take a sample of the established weight and wash it on the finest sieve until fine particles are removed; then dry the sample on the sieve and test in the Ro-Tap on the complete range of sieves selected from the coarsest to the finest. The difference between the original weight of the sample and total of the weights retained by the various sieves and pan must be added to the amount retained in the pan, and percentage calculated on the basis of the total weight.

Making the Test

The Ro-Tap has capacity of six full height sieves and a full height bottom pan or thirteen half height screens and half height bottom pan. Arrange the sieves to be used in the test in order with the coarsest sieve on top and a pan at the bottom. Dump the material to be tested in the top sieve and place the Item #20 Cast Iron Screen Cover fitted with the Item #19 Cork (both found in the parts box) on top of the nest of sieves.

Loosen the two bolts on the Item #28 Adjustable Plate Support with the wrench found in the parts box and lower it to its lowest position. Raise the Item #37 Hammer out of the way and also raise the Item #9 Upper Carrying Plate Latch.

Insert the entire nest of sieves on the Item #22 Sieve Supporting Plate, lower the Item #9 Latch and raise the Item #28 Plate Support until the Item #20 Cover just touches the stops on the Item #6 Carrying Plate. Then tighten the two nuts on the Item #25 Carrying Plate. This adjustment should be such that the Item #20 Cover can be rotated freely as it is important that the nest of sieves be loose enough so they will rotate freely in the Item #22 Supporting Plate when the Ro-Tap is in operation.

Lower the Item #37 Hammer and the Ro-Tap is ready for operation. If the Timer is used, set dial to show required number of minutes for the test and start the unit.

When the Ro-Tap stops at the end of the determined period, remove the sieves and weigh the amount of material retained on each sieve and in the bottom pan. Tabulate the results on a form similar to Form L-1 attached and calculate the percentages. For permanent record, a number of sieve tests can be recorded on Form L-3 attached, and the results can be plotted on either Cumulative Direct or Cumulative Logarithmic Plotting Paper. A sample of Form L-4 Plotting Paper is attached (Cumulative Direct, Ratio square root of 2). Other types of plotting and tabulating paper are available and samples will be sent on request.

For full information on Testing Sieves and their uses, write for a free copy of Handbook #53 entitled, "Use of Testing Sieves". This is a complete textbook that should be in the hands of every operator for it deals with all phases, from the taking of the sample to the plotting of the analysis.
Figure 3: “Exploded” Parts Diagram
<table>
<thead>
<tr>
<th>PART NO.</th>
<th>NAME OF PART</th>
<th>QUAN</th>
<th>REF NO.</th>
<th>NAME OF PART</th>
</tr>
</thead>
<tbody>
<tr>
<td>L-142</td>
<td>CARRYING PLATE CAP, WITH ITEM NO. 3</td>
<td>1</td>
<td>46</td>
<td>3/16&quot; DIA. X 1 1/16&quot; LG. ROLL PIN</td>
</tr>
<tr>
<td>7</td>
<td>NO. 162 ALEMTIC HYDRAULIC FITTING (60&quot;) ELBOW</td>
<td>1</td>
<td>47</td>
<td>PUSH ROD LEATHER</td>
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<tr>
<td>10</td>
<td>5/16&quot;-18 U.S.S. BINDING HEAD MACHINE SCREW 1/2&quot; L.</td>
<td>1</td>
<td>48</td>
<td>LOWER PUSH ROD GUIDE, WITH ITEM NO. 3</td>
</tr>
<tr>
<td>L-95-A</td>
<td>UPPPER SLIDE STOP</td>
<td>1</td>
<td>49</td>
<td>PUSH ROD END, WITH ITEM NO. 50</td>
</tr>
<tr>
<td>L-135</td>
<td>UPPPER CARRYING PLATE ASSEMBLY (CONSISTING OF ITEMS 5 &amp; 6)</td>
<td>1</td>
<td>50</td>
<td>3/16&quot; DIA. X 1 1/8&quot; LG. ROLL PIN</td>
</tr>
<tr>
<td>L-136</td>
<td>UPPPER CARRYING PLATE, WITH ITEMS NO. 3 &amp; 8</td>
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<td>51</td>
<td>ECCENTRIC SHAFT</td>
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<tr>
<td>L-95-B</td>
<td>BRONZE BUSHING ONLY FOR CARRYING PLATE</td>
<td>1</td>
<td>52</td>
<td>NO. 8 WOODRUFF KEYS</td>
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<td>L-192</td>
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<td>LOWER ECCENTRIC CAP, WITH ITEMS NO. 11 &amp; 14</td>
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<td>UPPPER ECCENTRIC CAP, WITH ITEM NO. 11</td>
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<td>55</td>
<td>VERTICAL SHAFT BEARING, WITH ITEMS NO. 16, 18 &amp; 19</td>
</tr>
<tr>
<td>L-188</td>
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<td>NO. 150 ALEMTIC HYDRAULIC FITTING STRAIGHT (LONG)</td>
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<td>L-152</td>
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<td>SPIRAL PIN 19 TOOTH (1150 r.p.m.), WITH ITEM NO. 60</td>
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<td>PIN SUPPORTING PLATE &amp; SPRING CLIP ASSEMBLY (CONSISTING OF ITEMS NO. 22, 23 &amp; 24)</td>
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<td>64</td>
<td>1/4&quot; LOCK WASHER</td>
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<td>L-162</td>
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<td>3/8&quot;-16 U.S.S. HEX. HEAD CAP SCREW 1 1/4&quot; L.</td>
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<td>PAN SPRING CLIP</td>
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<td>66</td>
<td>CANN</td>
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<td>L-134</td>
<td>PAN SHIFFT, WITH ITEM NO. 27</td>
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<td>MAIN SHAFT</td>
</tr>
<tr>
<td>L-136</td>
<td>PAN SHIFFT LOCKNUT</td>
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<td>MAIN SHAFT COLLAR, WITH ITEM NO. 46</td>
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<td>ADJUSTABLE DIVE PLATE SUPPORT, WITH ITEM NO. 20</td>
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<td>L-42</td>
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<td>OIL SEAL COVER (500 r.p.m.), WITH ITEM NO. 15</td>
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<td>OIL SEAL</td>
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<td>82</td>
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<td>L-42-A</td>
<td>PUSH ROD ASSEMBLY (CONSISTING OF ITEMS NO. 44 THRU 50)</td>
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<td>86</td>
<td>OIL FLINGER</td>
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Figure 4: Ro-Tap Assembly Diagram