

Procedures for Sand Reclamation Tests

1.0 Scheduling

- 1.1** All tests must be arranged through the Simpson sales department.
- 1.2** Reclamation Project Worksheet (copies attached) must be filled out and submitted with Safety Data Sheet (SDS) simpsongroup.com/equipment/sand-reclamation/pro-claim
- 1.3** A quote will be sent to the foundry.
- 1.4** Once the Purchase Order (PO) is received, the Lab will coordinate with the customer the shipping instructions and set a test date.
- 1.5** An RMA will be provided and sent to the customer. The material can then be shipped along with the completed data form and purchase order. The documentation should be attached to the drum.
- 1.6** All materials received by Simpson will be returned to the customer immediately upon completion of the test. The customer should provide instructions on where and how to ship the sand back to the foundry. We will not accept any materials without return shipping instructions. Customer is responsible for all shipping costs to and from Simpson.
- 1.7** A sand reclamation test report will be sent once lab tests are completed. It is recommended to review with a Simpson representative.

2.0 Fees and Shipping Costs

- 2.1** A fee will be charged for all Lab tests according to the following schedule. These charges will be in addition to the shipping costs listed in item 1. If new sand reclamation equipment is purchased from Simpson within one year of the test completion, the test fees paid, excluding shipping costs, will be credited to the equipment purchase.

- 2.2** Sand reclamation test fees:

\$2,500.00 The base fee for a typical trial requires three different tests performed at various scrub rates. Each test requires approximately 300 pounds (136 kg) of sand. In most cases, the physical tests require one 8-hour day and one 8-hour day to run the laboratory tests and write the reclamation report. To allow for some losses it is recommended to send us 1,200 pounds (545 Kg) of total sand for reclamation. Part #00TEST-REC-HR.

\$150.00/Hr Price per hour of additional labor, if necessary, over the 16 hours included in the base fee. Part #00TEST-REC-HR .

Customer is responsible for all shipping costs to and from Simpson.

Fees include issuance of a detailed Lab Report summarizing the results of the tests including all sand laboratory test results which will be sent to designated recipient. Sand laboratory testing typically includes at least the following tests on sand before and after pneumatic scrubbing:

Screen Analysis	M.B. Clay
AFS Clay	LOI
ADV	Ph

2.3 Safety Data Sheets (SDS) for all materials are required before shipment.

2.4 The dry Material must be sent in 3 individual 55-gallon drums totaling approximately 1,200lbs of sand. These must be wrapped on a skid with 1 empty 55-gallon drum. Drums and material will be returned at the customer's expense.

3.0 Test Observation

Customers and representatives are strongly urged to attend and observe test equipment, methods, and procedures used in performing the tests at our lab. Please let us know if we can assist you with hotel or other travel arrangements while visiting.

4.0 Laboratory Test

All Simpson Performance Lab reclamation tests are run in a single cell Simpson Even-Flo® model laboratory pneumatic scrubber. This unit has a 4" (10.2 cm) nominal diameter blast tube (3 5/8" actual I.D.) and is equipped with a 4 PSI (.28 bar) turbo blower. The scrubber test cell will hold approximately 300 lbs (136 kg) of dry sand. Typically, potential customers will ship to Simpson approximately 1,200 pounds (544 kg) of typical return sand in lump or granular form. The Simpson reclamation laboratory is equipped with a General Kinematics Vibra-Mill® lump breaker that is capable of reducing lump sand to near granular form. From the lump breaker the sand is transported on a short belt with a magnetic separator gear pulley to remove metal contaminants from the sand. Sand from the belt is emptied into a drum for charging to the Even-Flo scrubber via skip hoist. Once charged to the reclaimer the sand scrubbing can commence. Unlike production scrubbers, the lab unit is equipped with an air-operated deflector plate beneath the target. During operation, the deflector plate is set to allow the sand to recirculate within the single cell unit. At the designed time of discharge upon the completion of the scrubbing test the deflector plate is placed under the target to intercept the flow of sand dropping off the target perimeter and diverts it out through the scrubber classifier chute and final screen.

This arrangement allows Simpson to perform scrubbing tests on relatively small quantities (300 lbs/136 Kg per batch) of sand. By charging the sand into the unit and then turning on the scrubber for various lengths of time, we can simulate a variety of scrubbing (or residence) times with one batch of sand. For example, if we wish to observe the cleanliness obtained at scrubbing rates of 1,000, 1,500, and 2,000 lbs/hr/cell (907/1361/1814 kg/hr/cell), we can charge the scrubber cell with 300 lbs./136 Kg. of sand and set the timer on the deflector at the appropriate time as seen below for discharge of the material. Once the time for the test has elapsed, the sand is deflected out of the cell and a small sample (approximately 1 lb./45kg) is taken for lab tests. The remaining sand is discharged into the sample drum.

These times correspond to the following continuous scrubbing rates:

1st Run: $300\# \text{ divided by } 1000 \text{ scrub rate} = .3 \times 60 \text{ minutes} =$
1080 seconds (18 minutes)

2nd Run: $300\# \text{ divided by } 1500 \text{ scrub rate} = .2 \times 60 \text{ minutes} =$
720 seconds (12 minutes)

3rd Run: $300\# \text{ divided by } 2000 \text{ scrub rate} = .15 \times 60 \text{ minutes} =$
540 seconds (9 minutes)

In other words, if in a Pro-Claim production unit, each sand grain spent a total time of 270 seconds passing through scrubber cells, it would get as clean as spending 270 seconds in a single cell. The Rate arrived at for a scrubber cell is really the Input Rate because it is calculated based on the amount of sand charged to the scrubber. To determine the Output Rate, one must establish the yield through the scrubber.

4.0

All scrubbers lose material through the process of scrubbing (reclamation). If they didn't, the undesirable impurities and excess fines would accumulate in the sand. When a scrubbing test is run at Simpson, these waste materials are removed from the scrubber body through an exhaust system arranged internally in the scrubber housing to control the air removal from each cell individually. In addition, the Simpson scrubber is equipped with a fines control chute (exhausted louvered cascade) and a final screen to remove undesirable oversized particles. The "Yield" calculation for the Simpson unit is the weight of the total material charged to the unit divided into the weight discharged as good sand through the final screen. As you can see, this gives a true yield through the Simpson scrubber. Therefore, multiplying the Input Rate by the Yield (in percent) will give you the actual scrubbing system Output Rate of good reusable reclaimed sand. In this definition, a 100% yield would be impossible and undesirable since by definition we do wish to remove spent materials, contaminants and excessive fines.

We do not know how other companies calculate yield. We do know that some companies utilize means external to their scrubber to classify and screen the reclaimed sand. If their yield percentages reported reflect only the losses through their scrubber, it would be difficult to accurately compare their scrubber Output Rates with those of Simpson's units. One would have to add in the losses through external classifiers and screens put into the overall system to get the scrubbed sand to a usable condition.

The "Yield" figures reported by Simpson on their lab test reports are always lower than production units installed for the same sand. When a lab test is run, the test scrubber is internally cleaned of all material from the previous test. A certain portion of the 300 lbs./136 kg. of material charged into the cell for a test is lost in filling dead spaces in the scrubber. The dead space sand does not come out of the unit when the unit is discharged. This "prefill" loss is a relatively large part of a single 300 lbs./136 kg. test batch but insignificant when compared to the hundreds of tons passing through a production unit in a day's time. Simpson has maintained the practice of ignoring the sand needed to prefill the test scrubber because the "Yields" obtained by the present method of calculating gives them conservative percentages they know they can guarantee in production machines.

5.0

Even-Flo to Pro-Claim

The cell of a "Pro-Claim" model scrubber is identical in operation to that of an Even-Flo model unit except that the blast tube has been increased in capacity by increasing the internal diameter to 5.047". The cross sectional area of the Pro-Claim tube is 1.94 times the area of the Even-Flo tube and this, combined with a slightly increased air flow, permits the Pro-Claim tube to process approximately twice the capacity of an Even-Flo unit with the same number of cells.