

Reducing New Sand Consumption with Pneumatic Reclamation

Mitigate rising material costs, supply chain disruptions, scrap, and waste disposal by reclaiming foundry sand.

SIMPSON
A Norican Technology

Reconditioning

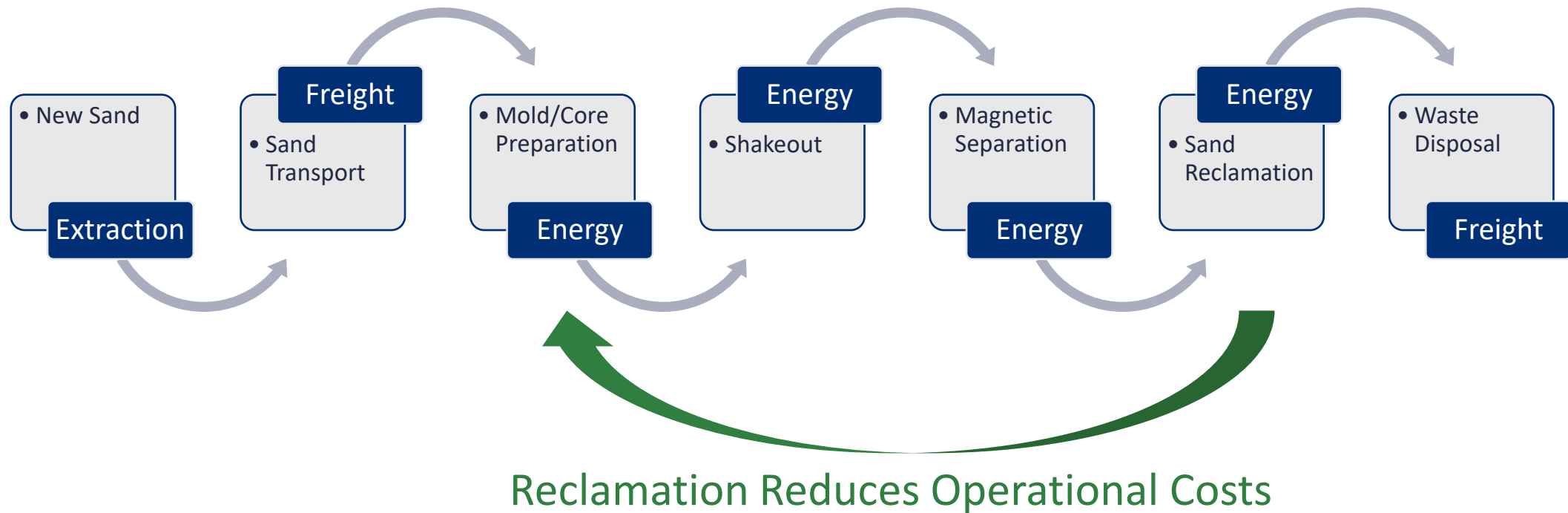
“Sand that has received some degree of cleaning work, but not enough to make the sand suitable as a new sand replacement.”

Reclamation

“The physical, chemical, or thermal treatment of a refractory aggregate to allow reuse without significantly lowering the original properties.”

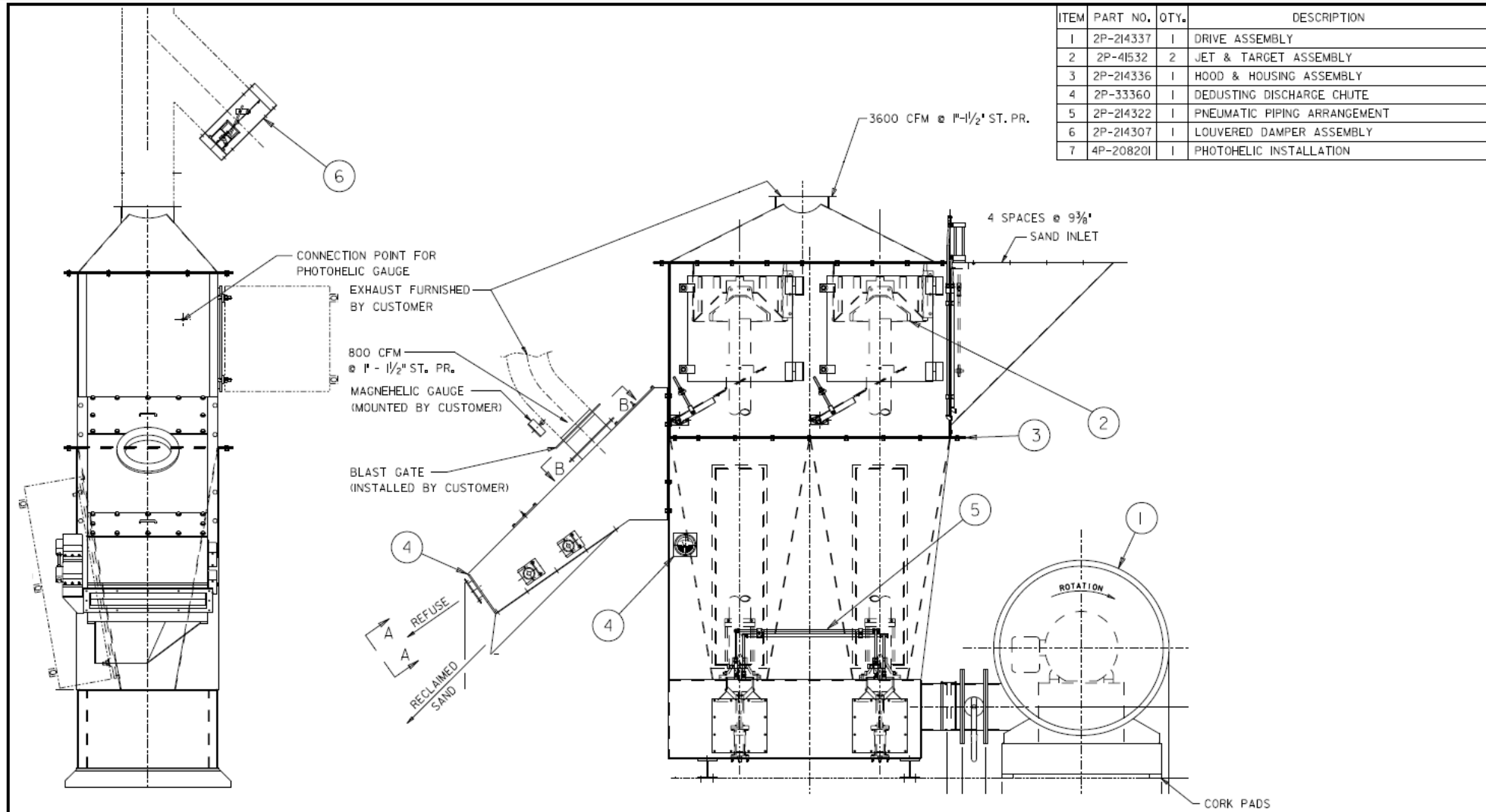
*As defined by the AFS 4S Committee on Sand Reclamation and Reuse

Reclamation Energy and Mass Balance

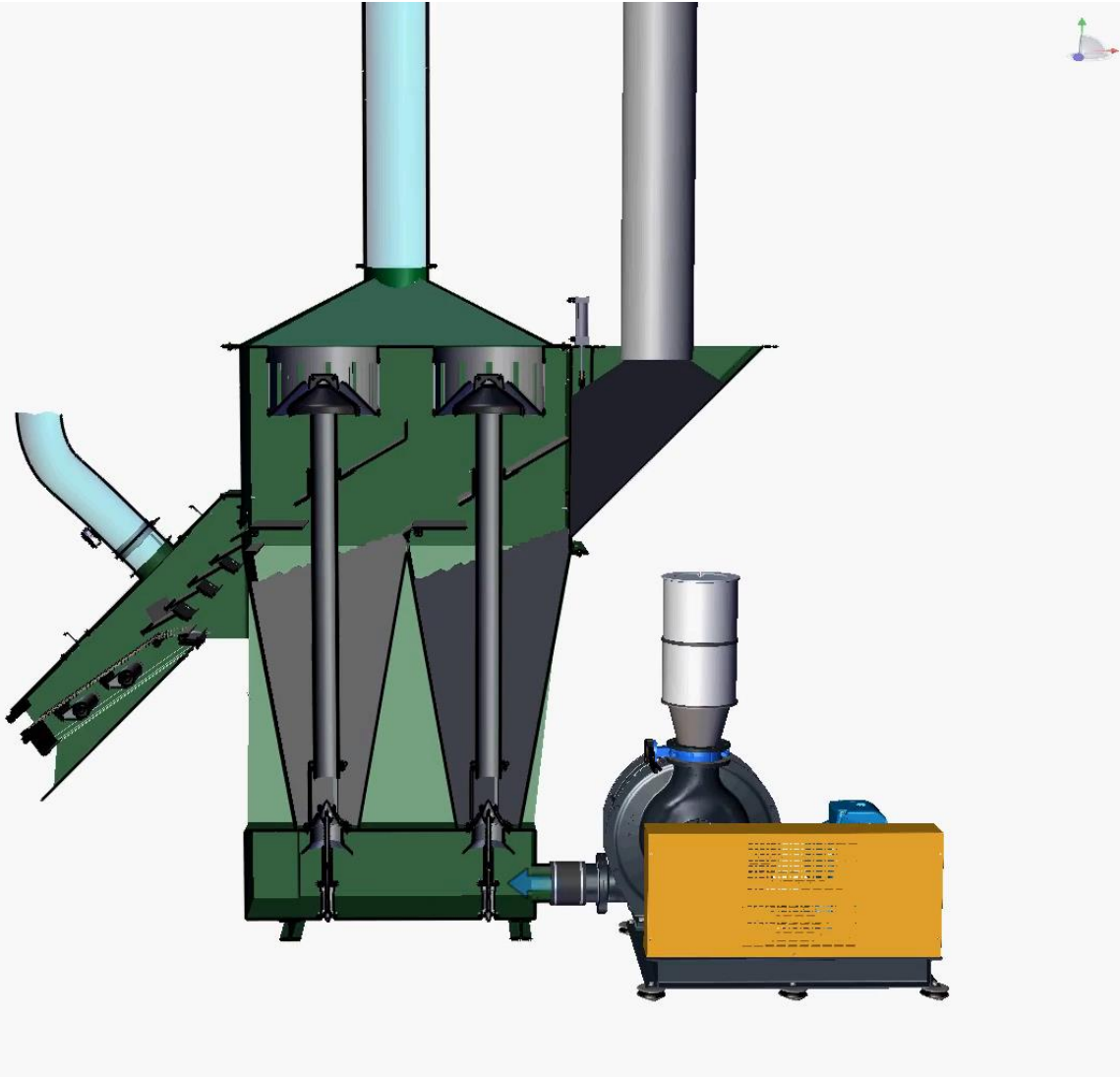


Reduce Fiscal Waste: New Sand Costs, Transportation Costs, Sand Disposal Costs, etc. with the Simpson Pro-Claim® Sand Reclamation System

General Assembly Drawing of the 2-Cell Pro-Claim

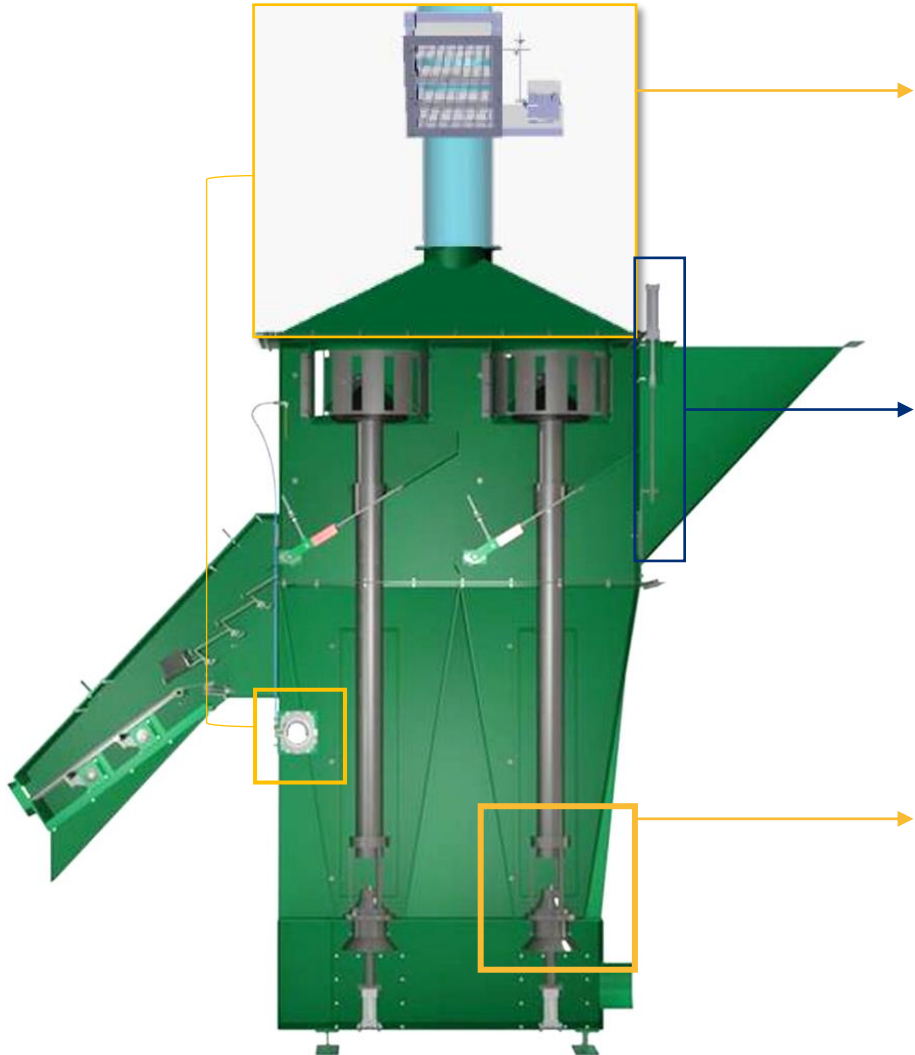


Pneumatic Reclamation: Customization Allows for Optimization



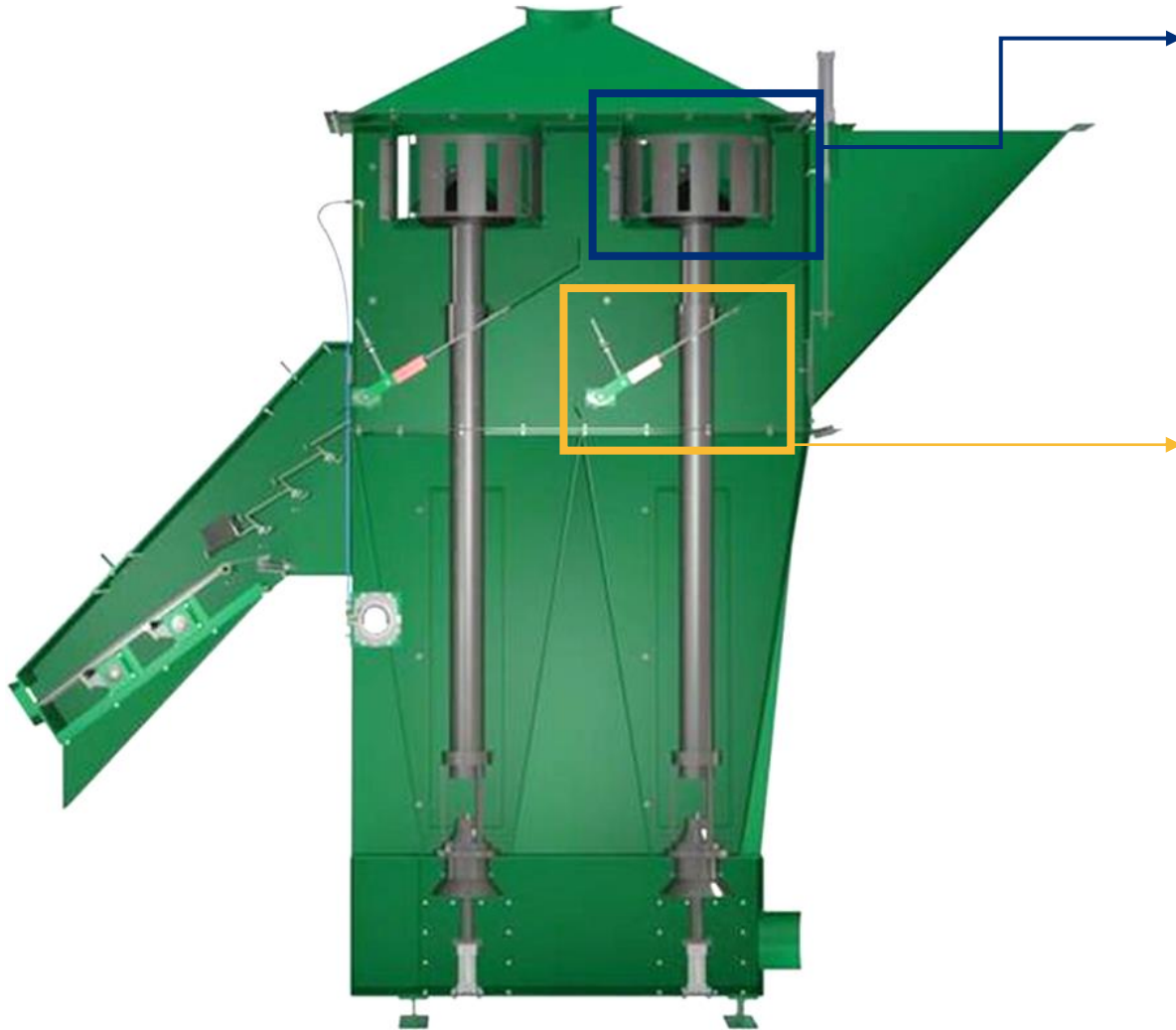
- Continuous sand reclamation
- Gravity fed
- Turbine blower introduces air into plenum, which accelerates through the nozzle at bottom of blast tube
- Sand/media accelerates up blast tube to target
- Sand/media scrubs again sand/media trapped in target
- As sand falls, dust collector removes fines
- Deflector plates allow for adjustments in retention time

Adjustable Components of the 2-Cell Pro-Claim Labelled



- **Air Plenum Negative:** The photohelic valve can be adjusted to regulate the Auto Damper. Adjusting the negative can pull more or less fines.
- **Charge door assembly** contains an adjustable plate to control the rate of sand fed into the Pro-Claim. This plate should initially be adjusted fully open; it may later be adjusted to reduce the required sand feed rate
- **Nozzle Gap:** Sand/media accelerates up blast tube to the target. By reducing the Nozzle Gap, a more aggressive scrub can be achieved.

Adjustable Components of the 2-Cell Pro-Claim Labelled



- **Exhaust Slide Gate:** Above the target in each cell is an adjustable exhaust slide gate. By varying the size of orifice, the velocity of the exhaust air can be regulated to control the amount and size of the fines which are exhausted. The gates may be adjusted smaller to increase the exhaust velocity and exhaust more of the unwanted fines.
- **Deflector plates** allow for adjustments in retention time. In each cell, the housing adjusting gate controls the sand flow between cells. Depending on its position, varying amounts of sand are passed on to the next cell or recirculated in the same cell for additional scrubbing. These gates should initially be set in a horizontally level position. They may later be adjusted upward to attain a higher throughput and a corresponding lower degree of scrubbing.



Simpson Equipment:

- 2-Cell Even-Flo
- 2-Cell Pro-Claim (pictured on the left)
- 4-Cell Pro-Claim

Operational Costs: \$1-1.3 USD/ton, numbers are higher in European nations due to the rise in power costs (€2.6-2.8 EUR/metric ton)

Spare Parts, Approximate Life:

- Cast Iron Blast Tube- 1,000 Hours of Operation
- Ni-Hard Target- 5,000 Hour of Operation

Continuous Sand Reclamation, No Operators are Required

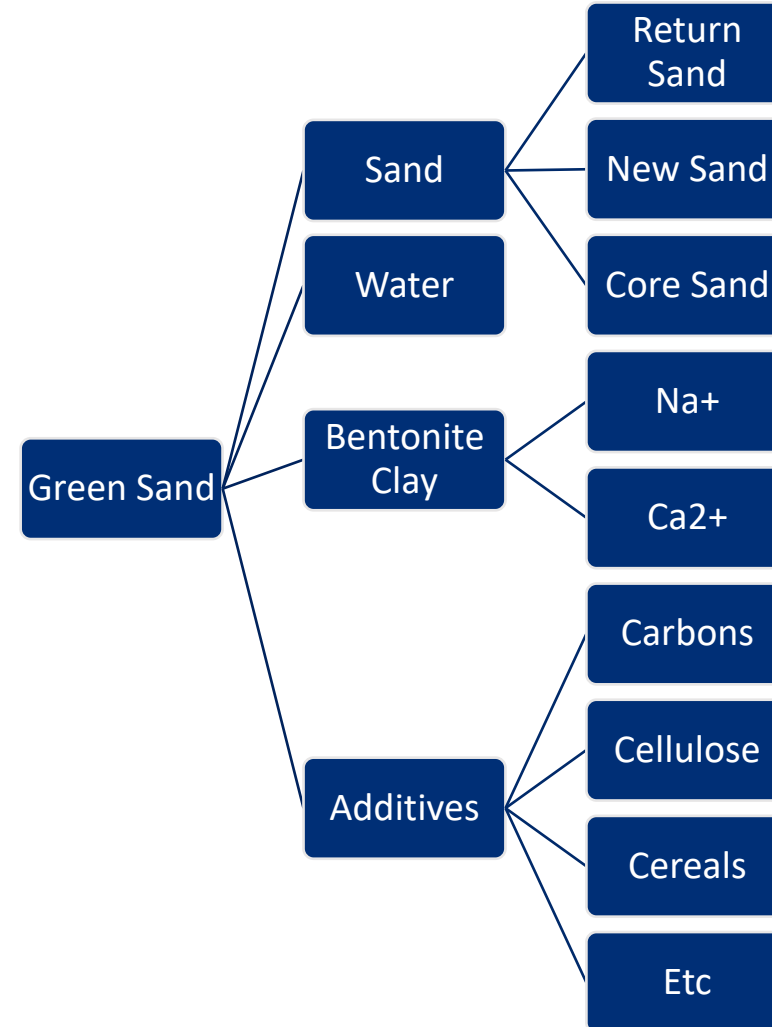
Affiliated Equipment Required: dust collector, electric power, compressed air, silo with gravity fed pipe into Pro-Claim

Green Sand to Green Sand

Objective:

Reclaim sand, reclaim methylene blue (MB) clay, reduce LOI, remove fines, maintain AFS grain fineness

Decrease new sand purchases, decrease bentonite clay usage, reduce sand disposal, and new sand consumption



Green Sand to Green Sand Reclamation

Silica Sand - Green Sand

Batch Number	1	2	3
Nozzle Gap Setting	6	6	6
EvenFlo Test Scrub Rate (lb/hr/cell)	1000	1500	2000
ProClaim Scrub Rate (lb/hr/cell)	2500	3750	5000
Plenum Negative - Inches	1.5	1.5	1.5

Sample Locations	As Rec.	1		2		3	
	Sand	Sand	Cyclone	Sand	Cyclone	Sand	Cyclone

AFS/GFN	78.54	78.80	204.61	83.44	198.19	78.34	197.68
Loss on Ignition (LOI) %	4.75	1.89		2.13		2.80	
AFS Clay %	9.66	2.80		4.36		5.21	
Methylene Blue Clay %	6.80	2.70		3.35		3.60	

LOI Reduction		60.21%		55.16%		41.05%	
ADV Reduction		74.07%		61.11%		48.15%	
AFS Clay Reduction		71.01%		54.87%		46.07%	
M.B. Clay Reduction		60.29%		50.74%		47.06%	

AFS Screen Distribution

Percent Retained

12 mesh	0.06	0.00	0.00	0.00	0.00	0.00	0.00
20 mesh	0.16	0.06	0.00	0.04	0.00	0.04	0.00
30 mesh	0.12	0.10	0.00	0.10	0.00	0.06	0.00
40 mesh	0.76	0.84	0.00	0.79	0.08	0.96	0.04
50 mesh	6.30	7.02	0.10	6.68	0.14	7.32	0.14
70 mesh	20.95	19.33	0.70	17.11	1.08	18.57	1.96
100 mesh	39.05	36.19	6.65	33.25	7.35	36.88	7.64
140 mesh	23.38	27.50	0.38	30.17	1.21	27.90	1.08
200 mesh	7.36	8.03	40.46	9.75	41.59	7.50	41.35
270 mesh	1.32	0.84	12.56	1.49	12.68	0.68	11.06
Pan	0.54	0.10	39.14	0.63	35.87	0.08	36.73

To the left is one of many tests conducted in our Headquarters. The Pro-Claim allows a foundry to “scrub” sand at different rates to yield different results. *Customization allows for Optimization.*

Return on Investment:

- Reduction of New Sand Purchases
- Recovery of Methylene Blue [MB] Clay
 - This foundry saves +3.6%
- Maintain Grain Fineness Number
- Reduction of LOI
 - This foundry reduced +41%
- Breaks down agglomerations
- AFS Clay Reduction with minimal MB Clay reduction
- Yield = approximately 78%
 - Losses: LOI, Fines, Dust
- 5000 lb/hr/cell: 2268 kg/hour/cell.
 - Yield of 2-Cell Even-Flo = 1814 kg/hr
 - Yield of 2-Cell Pro-Claim = 4536 kg/hr.
 - Yield of 4-Cell Pro-Claim = 9072 kg/hr.

One customer had IRR= 212%, 6-month payback

Green Sand to Green Sand Reclamation: See the Results



- When comparing the top image (Pre-Reclamation) to the bottom image (Post-Reclamation) we can see the sand has less dust, less debris, and less agglomerations after reclamation.
- Simpson sand reclamation effectively removed a significant quantity of dust, LOI, and other refuse from the sand bringing it to a healthy condition for the green sand system.
- This allows for a reduction in new sand purchases, sand disposal costs, and scrap from fugitive material build up within the sand system.

Solutions to Your Problems for Green Sand Foundries

Signs of a Problem

Loss in Green Strength –increase in inorganic binders chemical cores increases the pH and causes the bentonite clay to collapse.

Pinholes/Blowholes from gases caused by spent resins or high LOI on reconditioned sand.

Rough Surface Finish from the build up of agglomerations in the system.

Hot Tearing from a wider grain fineness distribution and consumes more binder than necessary.

High Waste Disposal/New Sand Purchases unnecessary dilution of sand system to compensate for high cores or contaminates in system.

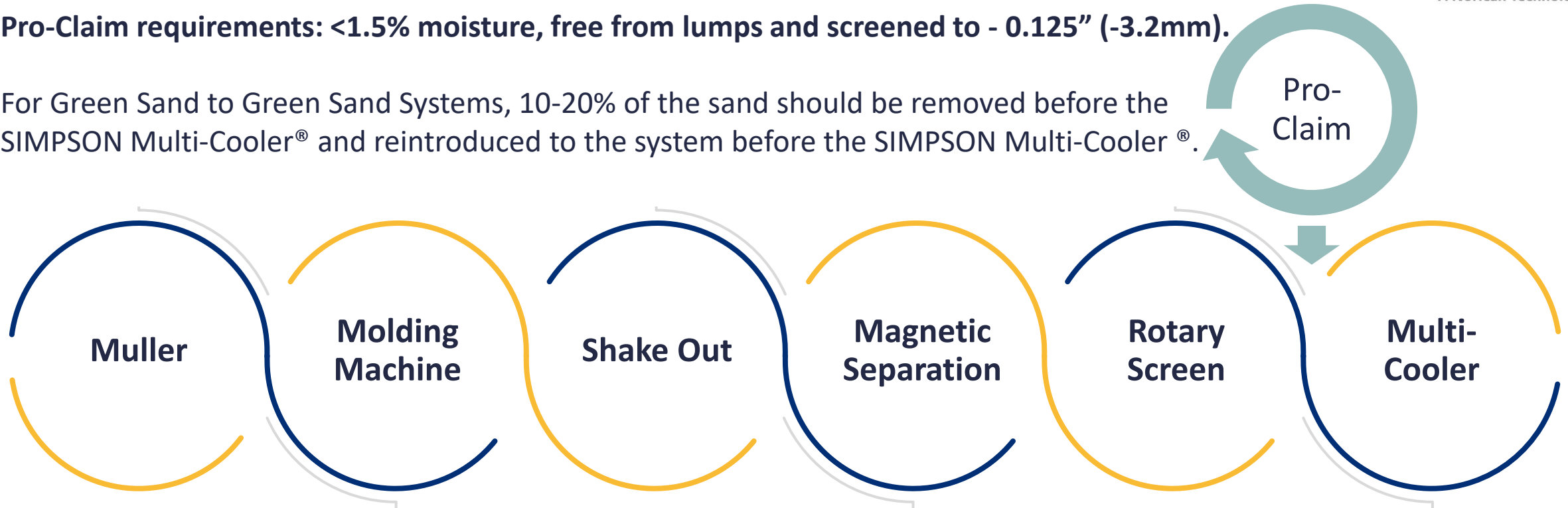
Solution



Green Sand to Green Sand: Machine Placement

Pro-Claim requirements: <1.5% moisture, free from lumps and screened to - 0.125" (-3.2mm).

For Green Sand to Green Sand Systems, 10-20% of the sand should be removed before the SIMPSON Multi-Cooler® and reintroduced to the system before the SIMPSON Multi-Cooler®.



In some foundries, new sand is added because there is no core sand to balance the loss. In others, it is used to dilute the core sand. Regardless of the purpose, the Pro-Claim provides vital sand cleaning and removal of agglomerations, LOI, and fines to promote higher quality castings.

Sand is the largest foundry process waste, typically constituting approximately 70% of the total waste volume.

Green Sand to Green Sand Reclamation: Layout



To the left is an example of a complete Norican Green Sand Foundry exhibited at GIFA 2023.

Typically, 10-15% of all return sand enters the Sand System and is sent back to the sand system after reclamation via:

- Pneumatic transport
 - Advantage: A Suspension Type Load Cell can be added to track the quantity of reclaimed sand.

- Conveyor Belt
- Bucket Elevator

The reclaim sand is sent to the following locations:

- Multi-Cooler
- Muller/mixer as a “new sand” addition
- Return Sand Silo

YOUR RESULTS

Reduce your environmental footprint.

Energy efficient sand reclamation that lowers waste and provides significant raw material cost savings.

3.2

YEARS OF PAYBACK

It will take you **3.2** years to payback the purchase

80%

CURRENT AMOUNT BEING DISPOSED OF

You currently dispose of **8 tons** each year. Simpson Reclamation will help you reduce that by up to **80%**!

\$1,230,000

FISCAL VALUES SAVED PER YEAR

With Simpson Reclamation you could be saving **\$1,230,000** per year

RECOMMENDED MACHINE

For customers like you, we tend to recommend a:
4-Cell Pro-Claim

[Download the flyer](#)



To the left is an example of a Return on Investment (ROI) Calculator to help foundries rapidly determine the value Simpson Sand Reclamation brings their foundry.

This feature will be available on the Simpson website this year.

Return on Investment Calculation:

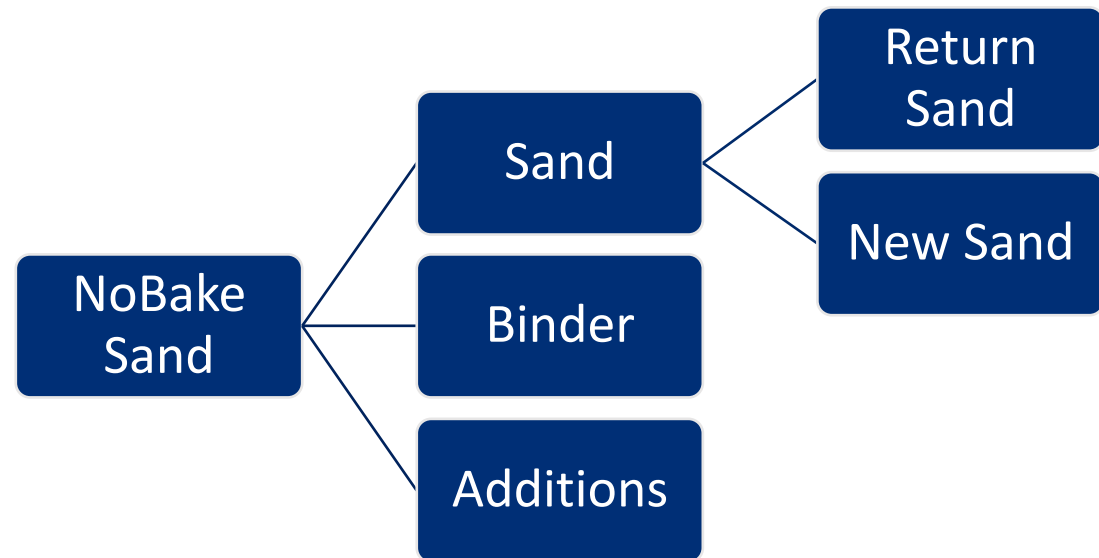
- Reduction of New Sand Purchases
- Reduction of Disposal Costs
- Considers Investment Costs

NoBake to NoBake Sand

Objective:

Reduce ADV, reduce LOI, remove fines, maintain AFS GFN

Decreases binder usage, reduce sand disposal, and new sand consumption



NoBake to NoBake Sand Reclamation

Silica Sand - Furan

Batch Number	1	2	3
Nozzle Gap Setting	6	6	6
EvenFlo Test Scrub Rate (lb/hr/cell)	1000	1500	2000
ProClaim Scrub Rate (lb/hr/cell)	2500	3750	5000
Plenum Negative - Inches	1.5	1.5	1.5

Sample Locations	As Rec.	Sand		Cyclone		Sand		Cyclone	
	Sand	Sand	Cyclone	Sand	Cyclone	Sand	Cyclone	Sand	Cyclone
AFS/GFN	41.76	46.80	183.52	45.53	176.61	44.07	178.48		
Loss on Ignition (LOI) %	2.36	1.28		1.50		1.44			
pH	6.01	6.17		6.07		6.12			
Acid Demand Value (pH 7)	5.60	1.80		2.40		4.00			
LOI Reduction		46.02%		36.33%		38.95%			
ADV Reduction		67.86%		57.14%		28.57%			

AFS Screen Distribution

Percent Retained	As Rec.	Sand		Cyclone		Sand		Cyclone	
6 mesh	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12 mesh	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20 mesh	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30 mesh	1.16	0.50	0.00	0.56	0.00	0.79	0.00		
40 mesh	25.30	20.84	0.10	21.56	0.12	27.79	0.30		
50 mesh	45.22	41.65	0.13	42.08	0.91	53.16	0.95		
70 mesh	22.99	24.50	1.55	25.86	4.54	4.61	6.03		
100 mesh	3.65	7.41	13.55	6.08	12.07	8.71	9.55		
140 mesh	1.12	3.22	4.87	2.23	8.76	3.36	6.93		
200 mesh	0.34	1.33	32.08	1.18	28.42	1.20	29.58		
270 mesh	0.10	0.36	19.74	0.32	18.59	0.28	20.01		
Pan	0.00	0.18	27.97	0.14	26.58	0.10	26.64		

To the left is one of many tests conducted in our Headquarters. *Customization allows for Optimization.*

Return on Investment:

- Reclamation of Sand to like-new
- Reduction of LOI
 - This foundry reduced +46%
- Reduction of ADV
 - This foundry reduced +67%
- Maintain Grain Fineness Number
- Breaks down agglomerations
- Yield = approximately 88%
 - Losses: LOI, Fines, Dust
- Simpson Reclamation Machine Yields for Chemically Bonded Sand:
 - Yield of 2-Cell Even-Flo = 907 kg/hr
 - Yield of 2-Cell Pro-Claim = 2268 kg/hr.
 - Yield of 4-Cell Pro-Claim = 4536 kg/hr.

Other Opportunity:

- For foundries interested in savings binder on sand, sand can be scrubbed at a faster scrub rate (seen in Batch Number 3) to reduce LOI, Agglomerations, and ADV, all while saving binder.

NoBake to NoBake Sand Reclamation: See the Results



- When comparing the top image (Pre-Reclamation) to the bottom image (Post-Reclamation) we can see the sand has less colors, less debris, and less agglomerations after reclamation.
- Simpson sand reclamation effectively removed a significant quantity of binder, LOI, and other refuse from the sand bringing it to a “like-new” condition.
- This allows for a significant reduction in new sand purchases, sand disposal costs, binder costs, and scrap from fugitive material build up within the sand system.

Recent Test Results



Reclamation Laboratory Test Results
 Foundry 1
 Test No. 042723-1, 2, 3 Date 27-Apr-23
 Simpson Technologies Laboratory EvenFlo Pneumatic Reclaimer

Silica - Hyperfuse PUNB Sand Reclaim

Batch Number	1	2	3
Nozzle Gap Setting	6	6	6
EvenFlo Test Scrub Rate (kg/hr/cell)	454	680	907
ProClaim Scrub Rate (kg/hr/cell)	1134	1701	2268
Plenum Negative - mm	38.1	38.1	38.1

Sample Locations	As Rec.	1		2		3	
	Sand	Sand	Cyclone	Sand	Cyclone	Sand	Cyclone
AFS/GFN	55.26	55.70	172.25	53.84	172.10	56.57	173.32
Loss on Ignition (LOI) %	1.15	0.75		0.80		0.91	
pH	7.39	6.98		6.96		6.94	
Acid Demand Value (pH 7)	1.20	0.40		0.50		0.40	

LOI Reduction	1		2		3	
pH	5.55%		5.82%		6.09%	
ADV Reduction	66.67%		58.33%		66.67%	

AFS Screen Distribution

Percent Retained

	1	2	3
6 mesh	0.00	0.00	0.00
12 mesh	0.00	0.00	0.00
20 mesh, 883 Micron	0.06	0.00	0.00
30 mesh, 589 Micron	0.50	0.48	0.00
40 mesh, 414 Micron	8.72	9.51	0.00
50 mesh, 295 Micron	21.44	21.46	0.14
70 mesh, 208 Micron	36.24	35.64	2.81
100 mesh, 147 Micron	25.58	24.81	19.69
140 mesh, 104 Micron	6.64	6.74	3.53
200 mesh, 74 Micron	0.68	1.02	37.29
270 mesh, 53 Micron	0.08	0.20	8.36
Pan	0.06	0.14	28.18



Reclamation Laboratory Test Results
 Foundry 2
 Test No. 020822-1, 2, 3 Hyperfuse Date 2/8/22
 Simpson Technologies Laboratory EvenFlo Pneumatic Reclaimer

Silica - Hyperfuse PUNB Reclaim

Batch Number	1	2	3
Nozzle Gap Setting	6	6	6
EvenFlo Test Scrub Rate (kg/hr/cell)	454	680	907
ProClaim Scrub Rate (kg/hr/cell)	1134	1701	2268
Plenum Negative - mm	38.1	38.1	38.1

Sample Locations	As Rec.	1		2		3	
	Sand	Sand	Cyclone	Sand	Cyclone	Sand	Cyclone
AFS/GFN	48.57	54.56	166.33	58.09	156.95	54.67	150.21
Loss on Ignition (LOI) %	0.71	0.47		0.48		0.47	
pH	8.64	8.61		8.68		8.71	
Acid Demand Value (pH 7)	4.60	2.10		2.40		3.00	

LOI Reduction	1		2		3	
ADV Reduction	54.35%		47.83%		34.78%	

AFS Screen Distribution

Percent Retained

	1	2	3
6 mesh	0.14	0.00	0.00
12 mesh	0.89	0.00	0.00
20 mesh, 883 Micron	1.36	0.00	0.00
30 mesh, 589 Micron	3.66	0.08	0.00
40 mesh, 414 Micron	10.23	6.48	0.00
50 mesh, 295 Micron	27.21	24.59	0.12
70 mesh, 208 Micron	36.24	38.52	3.46
100 mesh, 147 Micron	16.82	24.03	22.48
140 mesh, 104 Micron	3.01	5.50	3.62
200 mesh, 74 Micron	0.31	0.72	36.17
270 mesh, 53 Micron	0.06	0.06	7.88
Pan	0.08	0.02	26.27

Same binder, different foundries

- Phenolic Urethane, No Bake
- Silica, Quartz Sand
- Sand quality and cleanliness impact the results of the reclaim
- Yield: +79%

YOUR RESULTS

Reduce your environmental footprint.

Energy efficient sand reclamation that lowers waste and provides significant raw material cost savings.

3.2

YEARS OF PAYBACK

It will take you **3.2** years to payback the purchase

80%

CURRENT AMOUNT BEING DISPOSED OF

You currently dispose of **8 tons** each year. Simpson Reclamation will help you reduce that by up to **80%**!

\$1,230,000

FISCAL VALUES SAVED PER YEAR

With Simpson Reclamation you could be saving **\$1,230,000** per year

RECOMMENDED MACHINE

For customers like you, we tend to recommend a:
4-Cell Pro-Claim

[Download the flyer](#)



To the left is an example of a Return on Investment (ROI) Calculator to help foundries rapidly determine the value Simpson Sand Reclamation brings their foundry.

This feature will be available on the Simpson website this year.

Return on Investment Calculation:

- Reduction of New Sand Purchases
- Reduction of Disposal Costs
- Considers Investment Costs

Solutions to Your Problems for Chemically Bonded Foundries

Orange Peel from High Acid Waste Products (ie furan)

Pinholes/Blowholes from gases caused by spent resins on reconditioned sand.

Fins from excess resin/catalyst caused by too much resin on reconditioned sand, which reduces the work time of a mixture and mechanical strength.

Rough Surface Finish from the build up of agglomerations in the system.

Abnormal Graphite Nodules from reconditioned sand has a high content of sulfur containing compounds such as the catalyst.

Hot Tearing from a wider grain fineness distribution and consumes more binder than necessary.

Solution

Sand Reclamation



Chemical Sand to Chemical Sand: Machine Placement

Pro-Claim requirements: <1.5% moisture, free from lumps and screened to - 0.125” (-3.2mm).

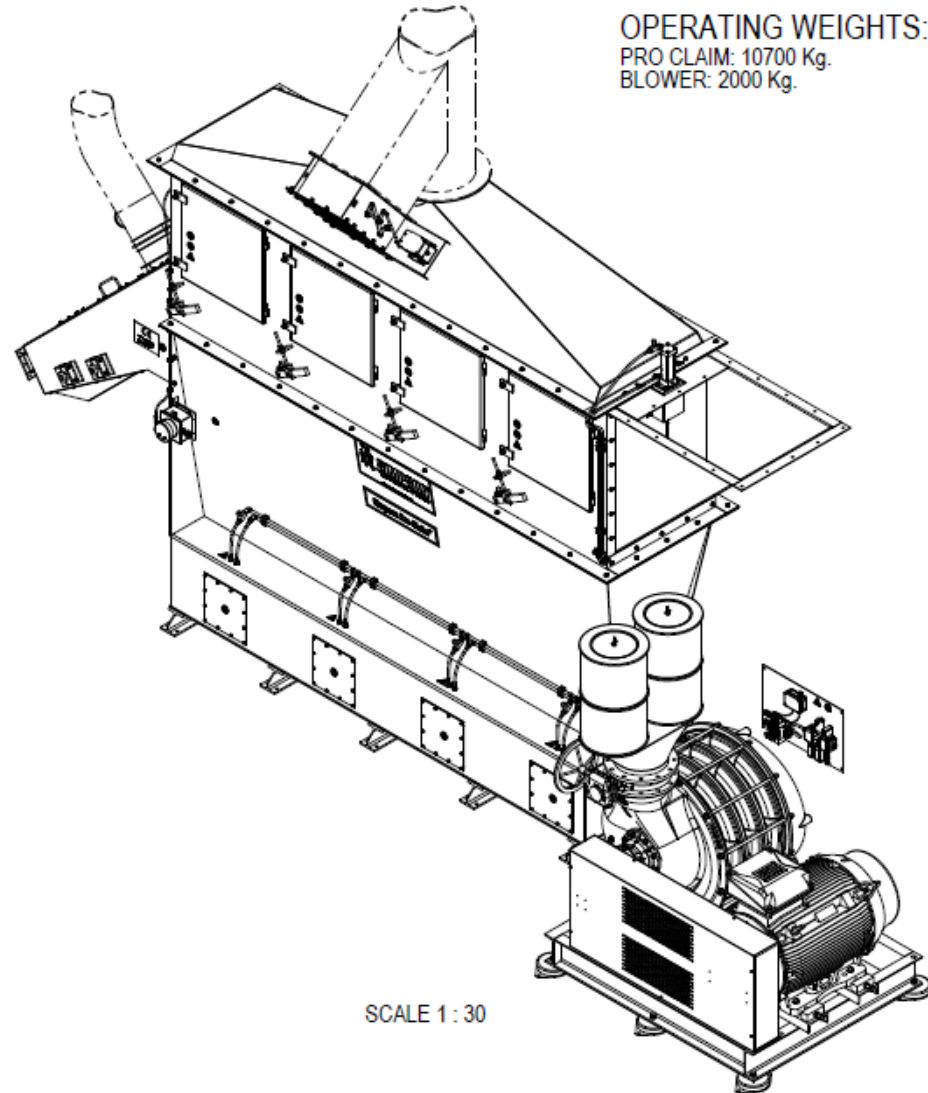
For Chemical Sand to Chemical Sand Systems, all the sand of the sand should be processed by the Pro-Claim to reduce new sand purchases.



The Pro-Claim can reclaim sand with minimal rounding of the grains, reduce the ADV or help neutralize the pH, and reduce the LOI allowing the sand to be used as “like-new”. Our case study is a foundry using 84% returned sand from the Pro-Claim and 16% new sand—reducing monthly purchases from 50T to 8T.

Sand is the largest foundry process waste, typically constituting approximately 70% of the total waste volume.

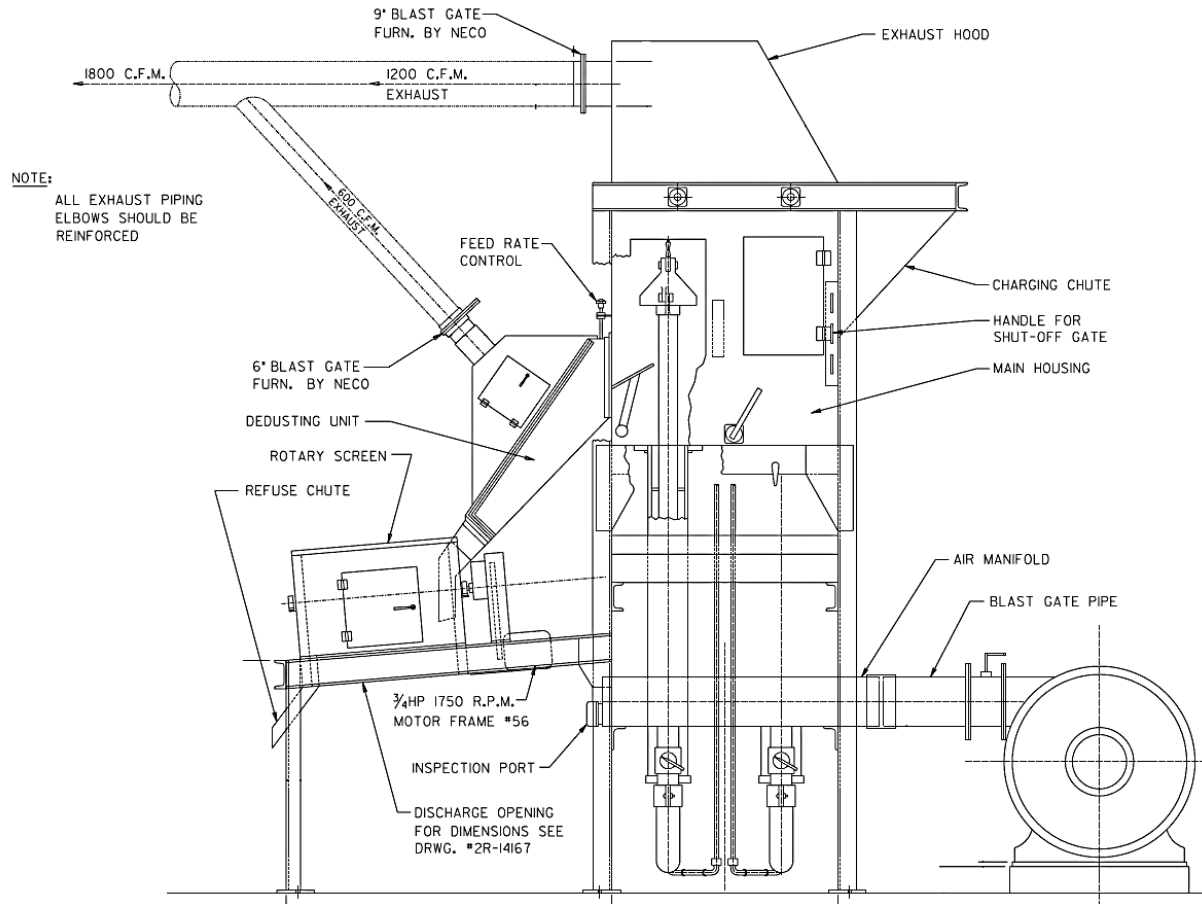
General Assembly Drawing of the 4-Cell Pro-Claim



To the left is an example of a 4-Cell Pro-Claim. The 4-Cell Pro-Claim is much like the 2-Cell Pro-Claim and with 2 additional cells. This allows the 4-Cell Pro-Claim to double the capacity of the 2-Cell Pro-Claim.

- Adjustments are slightly different to start production. In the 4-Cell, the first and fourth cells should initially be set full open, and the second and third cells should initially be set two-thirds open.
- Utility consumption, blower sizing, and footprint are larger to accommodate the larger demand.

General Assembly Drawing of the 2-Cell Even-Flo



On either side are examples of the 2-Cell Even-Flo.

The 2-Cell Even-Flo follows the original design of the sand reclamation systems. It does not process as much sand per hour as the 2-Cell Pro-Claim due to:

- Smaller blower
- Smaller blast tube diameter

The 2-Cell Even-Flo does contain a built-in platform fabrication to support access to the deflector handles and the access doors.

*Not ready for sale in the EU. No CE Markings.



- **Website:** [Simpson Pneumatic Reclaimer - Simpson Technologies \(simpsongroup.com\)](https://www.simpsongroup.com)
- **Data Sheet:** [Reclamation-Data-Sheet.pdf \(simpsongroup.com\)](https://www.simpsongroup.com)
- **Sequence of Operation:** [PRO-CLAIM-SEQUENCE-OF-OPERATION-Flyer.pdf \(simpsongroup.com\)](https://www.simpsongroup.com)
- **Sand Reclamation Test Program:** [Simpson Sand Reclamation Test Program – YouTube](https://www.youtube.com/watch?v=...)
- **Testimonial:** [Simpson Solutions - Manufacturer's Brass and Aluminum Foundry - YouTube](https://www.youtube.com/watch?v=...)