The construction of Open Stacked Rapid Sand Filters, or OStaRS, has been determined to be a difficult and labor-intensive process. The absence of a uniform installation procedure and proper construction methods leads to the overall inefficiency of the OStaRS assembly process. The Spring 2016 OStaRS Fabrication Sub-Team was tasked with developing three design modifications to ease with installation, which include a spacer system to be installed between filter modules, a movable platform for operators to stand on during assembly, and a holder system to fixate the dead end of the filter trunk line. The team has designed and fabricated the spacer and the platform systems. These designs were successfully stress tested, approved for field implementation, and are currently set for installation in one AguaClara treatment plant.

Link to Report:
https://confluence.cornell.edu/display/AGUACLARA/Fabrication?preview=/137953871/335435444/fabrication-team-ostars.pdf

Installed OStaRS filter modules.

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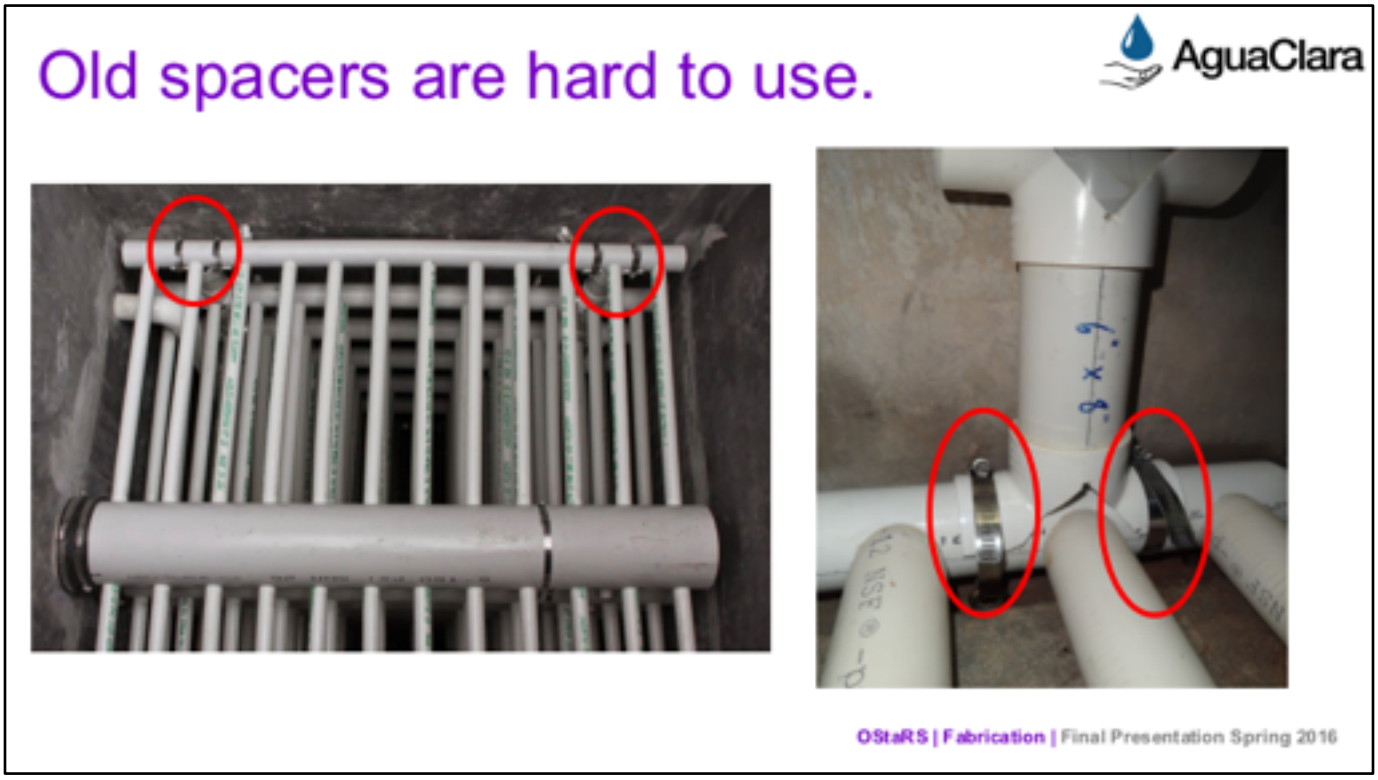
Picture taken from CUAguaClara@gmail.com photos page under the album “Honduras Trip (January 2016)”.

The filters are hard for operators to assemble because of the the limited space in the tank.

Give an idea of how big the module is and show how it is installed in the filter.



Picture taken from CUAguaClara@gmail.com photos page under the album “San Matias”.

Figure Caption: The old spacer was a system of halved PVC tees connected by a PVC stub. To secure the spacer onto the filter module, the operators would attach two hose clamps around the spacer and module.

The adoption of hose clamps to attach the spacer to the modules is a not a preferred method since first, a screwdriver is needed; further, the hose clamps are hard to loosen when sand fills in them

Picture taken from the lab downstairs.

Figure Caption: The current designs for the top, middle, and bottom spacers fabricated by the team this semester. The holes shown are the locations for the cotter pin to prevent any rotation of the spacer.

The Spring 2016 team fabricated a mini spacer system involving three distinct components - a top spacer, middle spacer, and bottom spacer. Each of these designs is different to accommodate the position of the modules in relation to the spacer.

The bottom spacer is a special case since it must be attached to the filter floor in some way so that the network of spacers does not lift during backwash. The filter floor contains stainless steel loops that were previously used to secure modules by wrapping hose clamps around the loops and the module. Since the module will lie directly on the stainless steel loop, the bottom spacer will need to contain a hole so that both the loop and module can rest on the spacer. This method of incorporating the loop to the bottom spacer effectively fixes the bottom spacer to the filter floor.
See Appendix Slide titled "Stainless Steel loops on filter floor" to see images of the filter floor.

The top spacer will similarly need to be fixed to the filter in some way to prevent rotation. Any rotation exhibited by the spacer system will result in spacer failure as the entire system of spacers will fall. To prevent this, a hole was placed through the latches and the body of the spacer underneath. This hole will be filled by a cotter pin that serves to permanently attach the spacers together until disassembly is required.

See Appendix Slide titled "Cotter pin attachment to spacers" for the method of inserting the cotter pin.

Picture taken from the report.

Figure Caption: A close-up of the top spacer illustrating the degree of rotation exhibited even with a cotter pin installed.

The top spacer is the most crucial to the stability of the spacer system. If this is locked into place properly, the filter modules will not exhibit the natural tendency to shift during filter and backwash operation. The cotter pin was initially added to lock the top spacer in place. However, when testing, the top spacer was allowed a slight degree of rotation. To prevent the rotation, the team hypothesized that the slot in the latches can be replaced by a hole/cotter pin. This will minimize rotation and contribute to the overall stability of the spacer system.

Picture taken from CUAguaClara@gmail.com photos page under the album “Honduras Trip 2016”

Figure Caption: An operator standing on an installed module while inserting spacers.

The previous method for filter assembly involved operators standing on modules while installing new modules. This was not advised since the weight of the operator could cause module deformation that would lead to reduced filter performance. This semester, the team was tasked with the challenge of designing and fabricating a platform that operators could stand on during the filter assembly process. This platform would have to be lightweight so that operators could easily maneuver the platform into the filter box and strong enough to hold the weight of an operator for extended lengths of time.

Operators can now stand on platform for assembly.

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Stress test: 470 lbs

Pictures taken from CUAguaClara@gmail.com photos page under the album “Las Vegas” and from the report.

Left Picture Caption: The rectangular channels with the depth of 5 cm and the height of 11 cm which will support the platform in Las Vegas, Honduras
Right Picture Caption: The finalized platform design shown after stress testing. The platform is slightly bent to show the flexibility of the design.

The platform will be inserted into the rectangular channels of the filter and moved to aid in filter assembly. This platform eliminates the need for operators to stand on the modules during assembly.

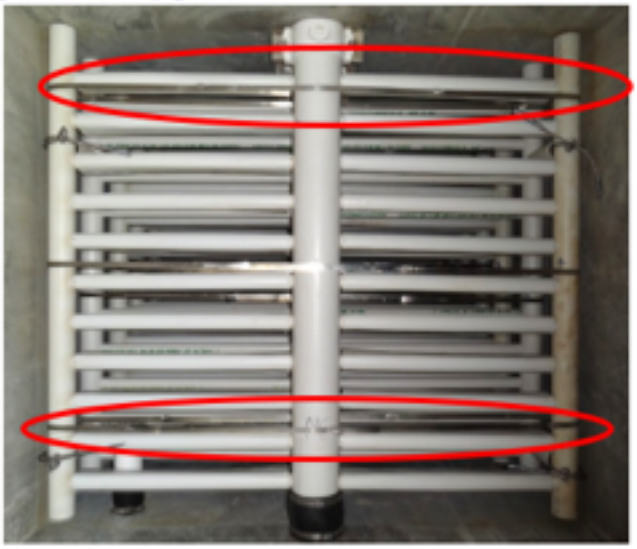
Future Work: The platform is heavy.

Pictures taken from the report.

Figure Caption:
The platform is connected by a hinge with two brackets fixed on one piece of the wood. The cut is intentionally made off-middled to better distribute the force.

The good-quality wood is heavy, however, lighter and less condense one is not strong enough to hold the required weight. In the future, the challenge is to reduce the weight of the platform to make it more convenient for operators to manipulate.

Future Work: Remove hose clamps from filter.



Picture taken from CUAguaClara@gmail.com photos page under the album “Planta AguaClara San Matias (2015-2016)”
Caption:

Figure Caption: The holders are utilized to prevent the modules from detaching and the sand from filling

If there are any appendix slides that are relevant to this slide, mention it in your notes.

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Questions and Recommendations

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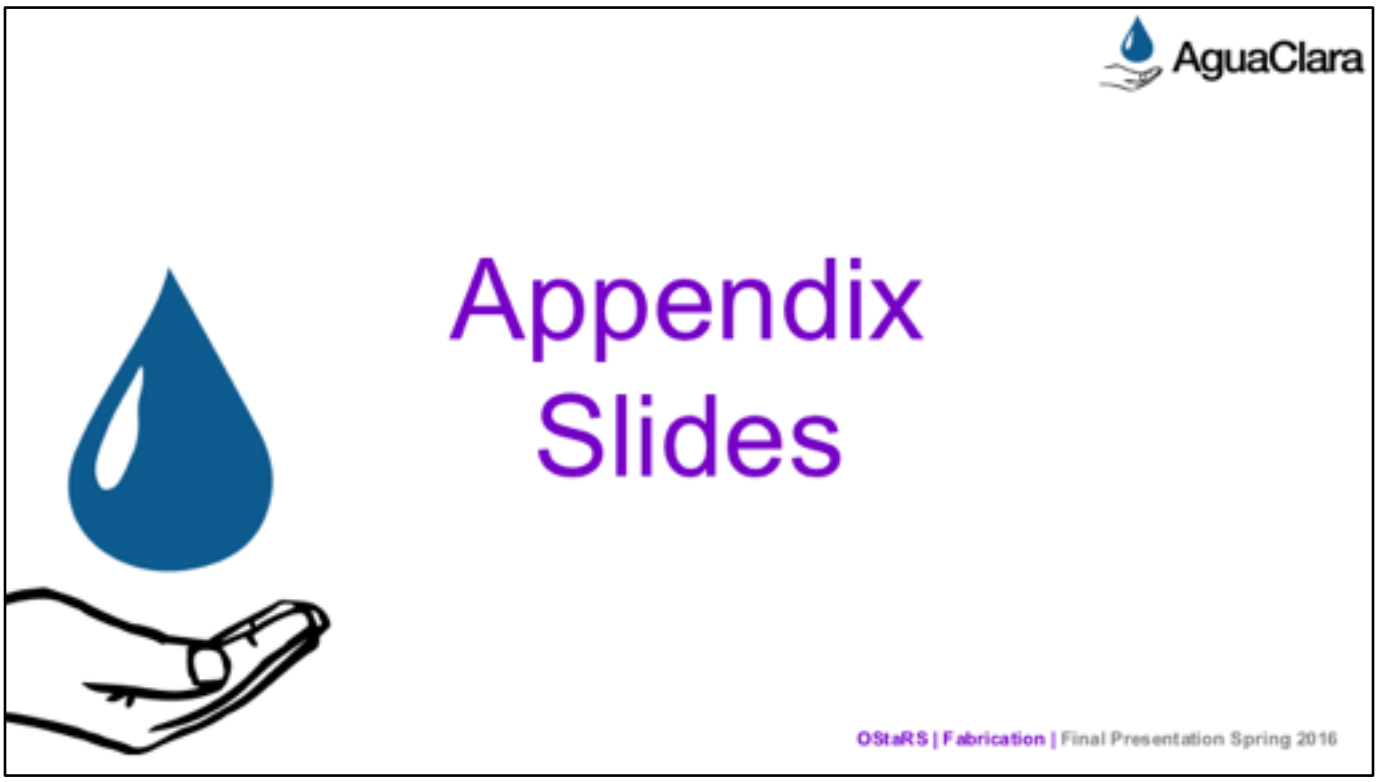

From this point on, add any slides with figures that will help support your thesis. You might pull these figures from your Final Report.

Stainless steel loops on filter floor.

Pictures taken from “Planta AguaClara Las Vegas (2016)” in CUAguaClara@gmail.com Photos.

Left Figure Caption: Stainless steel loops shown on the floor of the filter during construction of the plant in Las Vegas.
Right Figure Caption: Stainless steel loops shown on the floor of the filter after concrete was poured on the filter floor.

Cotter pin attachment to spacers.

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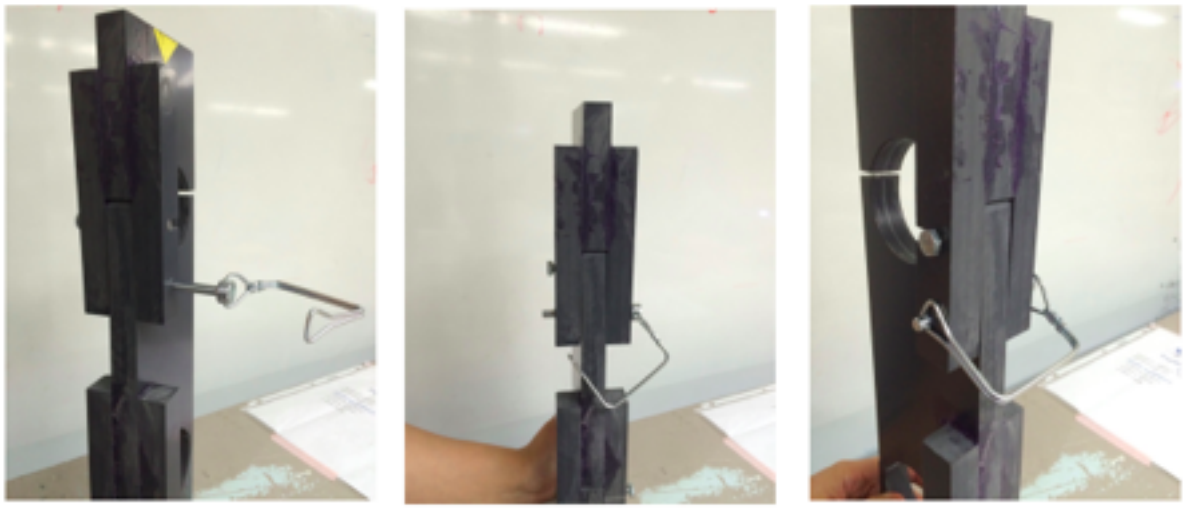

Pictures taken in AguaClara lab.

Figure Caption: This series of pictures shows, from left to right, how to insert and lock the cotter pin into the spacer.