Project Deliverable C

Parts 1 and 2.

The needs have been interpreted into three categories of specifications, functional, non-functional and constraints. Each category is organized into highest priority being at the top (lowest number).

This table represents target specifications regarding the products used for benchmarking, while using the same design specifications applied for our current project/product

Design Specifications	Units	Benchmark #1	Benchmark #2	Benchmark #3
Functional requirements		**Briggs & Stratton 3000 PSI (Gas pressure washer)**	**Danby Energy Star Portable Countertop Dishwasher, 22 in**	**CBK Automatic Touchless Truck and Bus Wash Machine SC201**
1. Visual clean	boolean	yes	yes	yes
2. Automated	boolean	no	yes	yes
3. Time to complete clean	min	depends on size of clean	20-120 (depends on cleaning cycle)	10-12
4. Area of clean	m^3	infinite	0.0657 m^3	210 m^3
5. Cleaning shape (2d, 3d)	2d or 3d	3d	3d	3d
6. Chemicals used	# of chemicals used	1 (soap)	1 (dishwasher detergent)	3 (cleaning fluids)
7. Fail-safe (in case something wrong happens)	boolean	no	no	yes
8. Dries after/during clean.	boolean	no	yes	yes
Constraints		**Benchmark #1**	**Benchmark #2**	**Benchmark #3**
1. Size	m^3	0.365 m^3	0.119 m^3	450 m^3

2. Power requirements	V	N/A	120	380
3. Change in pH of cleaned object.	boolean	no	no	no
4. Backup plan for blackouts.	boolean	N/A (no power)	no	unknown
5. Use of consumables	boolean	yes (soap)	yes (dishwasher detergent)	yes (cleaning fluids)

Non-functional requirements		**Benchmark #1**	**Benchmark #2**	**Benchmark #3**
1. Easy to use	# of buttons	unknown	4	unknown
2. Product life	years	unknown	unknown	unknown
3. Requires a specialist to repair	boolean	yes	no	yes
4. Cost	$	799.99	479.99	5838522.50

Note: The row for process is not stated as the process for almost every step included going to one of 3 websites and finding each specification.

For Benchmarks 1 and 2:
Canadian Tire
https://www.canadiantire.ca/en/pdp/danby-energy-star-portable-countertop-dishwasher-6-place-settings-silverware-basket-22-in-white-0432605p.html (1)

https://www.canadiantire.ca/en/pdp/briggs-stratton-3000-psi-gas-pressure-washer-0398730p.html (2)

For Benchmark 3:
Alibaba and CBK Carwash
https://www.alibaba.com/product-detail/Wash-Car-CBKWash-Systems-Wash-Bus_1600464542877.html?spm=a2700.7724857.0.0.2f285775DDh72A&s=p (3)

https://www.cbkcarwash.com/cbk-bus-truck-large-vehicles-touchless-robot-car-wash-machine-2-product/ (3)

UPDATED USER BENCHMARKING (regarding Deliverable B):

Small Scale Local Hydroponic Growers

- Scrub Brushes/Sponges/Clean Rags

Like those using products provided by The Growcer, most hydroponic growers use heavy duty scrub brushes to clean their boards. Some of their experiences with this cleaning method are as follows:

-Bad quality brushes come apart after a few uses and need to be replaced. Most commonly bristles fall out.
-Wooden scrub brushes don't fair well with water; plastic brushes are usually better.
-Some hydroponic gardners use **food grade hydrogran peroxide** or **vinegar** in combination with a good brush or sponge
    -Cheap sponges also come apart
-One gardner said that sponges that are too rough have damaged his styrofoam boards

- High Power Water Jet

A few hydroponic growers, especially those using plastic or wooden trays use high power water jets to spray down their rafts.

- (This is a link that one hydroponic gardner that I spoke to gave to me for a product that he is happy with: https://www.amazon.ca/Pressure-Watering-Universal-Cleaning-Extendable/dp/B08FDR1P8B/ref=asc_df_B08FDR1P8B/?tag=googleshopc0c-20&linkCode=df0&hvadid=578924497433&hvpos=&hvnetw=g&hvrand=13754415094919149052&hvpone=&hvptwo=&hvqmt=&hvdev=c&hvdvcmdl=&hvlocint=&hvlocphy=1002604&hvtargid=pla-945586190303&psc=1)
- These can also be used in combination with vinegar or another plant safe cleaning device

Industrial Level Raft Cleaners

Limex is the leading manufacturer of industrial level hydroponic raft washers. They produce large customizable machines that can be fitted to the needs of any given gardner. Their washers, similar to dish washers or car washes, use a mixture of high power jets and automatic scrub brushes. https://www.limex.nl/en/machines/float-washers/

-Automatically doses rafts with proper amount of hydrogen peroxide
-uses specific water spraying pattern to avoid damaing rafts
-Guaranteed visually and microbiologically clean floating rafts
-Can blow off water droplets
-Various disinfection methods
-Washing water heated by electric heating, heat exchanger or steam injection;
-Also has dry hydroponic washers

3.

This table represents target specifications regarding our project/product

Design Specifications	Units	Relation	Target Value
Functional requirements			
1. Visual clean	boolean	=	yes
2. Automated	boolean	=	yes
3. Time to complete clean	min	<	360 (6 h)
4. Area of clean	m^3	<	0.495 m^2 x unknown third length
5. Cleaning shape (2d, 3d)	2d or 3d	=	3d
6. Chemicals used	boolean	=	no
7. Fail-safe (in case something wrong happens)	boolean	=	yes
8. Dries after/during clean.	boolean	=	yes
Constraints			
1. Size	m^3	<	2.23 m^2 x unknown 3rd length (wall)/ 1.86 m^2 x unknown 3rd length (table)
2. Power requirements	V	=	(2) 120

3. Change in pH of cleaned object.	boolean	=	no
4. Backup plan for blackouts.	boolean	=	yes
5. Use of consumables	boolean	=	no

Non-functional requirements			
1. Easy to use	# of buttons	<=	5
2. Product life	years	>	2
3. Requires a specialist to repair	boolean	=	no
4. Cost	$	<	unknown

4.

The initial client meeting gave us most of our need statements for Deliverable B and the constraints needed to create the design criteria for technical benchmarking

After reflecting on our need statements certain specifications were needed even though we did not have need statements to base them off of. The specifications that were created from new updates needs include (bold = updated need section):

- Fail-safe - **The product must be able to stop when an unexpected event occurs.**
- Requires a specialist to repair - Can work in a remote area (lack of material/blackout) **and no access to professionals to repair.**
- Product life - **It should be able to last for many years without need for constant repair attention.**
- The product must ensure time efficiency for the client: it should be automated. (1)
- One of the aims is to reduce manual labor by a factor of 0.5
- **200-amp service connection is needed for the panels**
- **The panel is 40ft long, 10ft wide, pre-built, and isolated**
- **Plants are grown for 2 weeks in ceiling area then transferred to side racks for 4 weeks before they are harvested**
- Easy to use (users don't have much experience) (2)
- **The process cannot rely on electricity because that would require electricians to be on call and plants must be able to survive for 3-4 days without electricity in the greenhouse**

- **Client prefers a focus on reducing water consumption over recycling water for cost efficiency**
- Clean all areas of the board (borders + corners) (3)
- **Client is moving from using Styrofoam to using a less porous high-density polyethylene**
- Fits in the designated area for practical reasons (4)
- **The panel is 40ft long, 10ft wide, pre-built, and isolated**