

## Project Deliverable C: Benchmarking and Target Specifications

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February 2, 2025

## **Introduction**

This document outlines the design criteria derived from client needs, and organizes them into target specifications in order to effectively develop a product that meets the user requirements. Technical benchmarking was also performed to gain an idea of what features and specifications similar products that are already on the market include.

## **Design Criteria**

Need	Design Criteria
Fit in CANDU fuel channel	Thickness (mm)
Retrieve a sample 4.572 m from inlet	Length (m)
Provide necessary power sources	Integrating a rechargeable battery system with sufficient capacity for all components (camera, LEDs, etc.)
Suitable for both horizontal and vertical orientation	Including an adjustable arm or a flexible guide
Design is portable	Modular Weight (lbs)
Ensure precise sample size	Sample size (mg)
Low cost	Cost (\$)
sustainable	Reusable Made of eco-friendly materials Powered sustainably Fail-safe
Sample cannot come in contact with operator	Storage/container
User Friendly	Must be simple enough that a college educated person can use it

## Technical Benchmarking

Specifications	<i>Kinectrics CWEST</i>	<a href="#"><i>VersaTrax VT205</i></a>	<i>Diesel</i>
Weight	Not publicly disclosed	6.8kg (15lb)	2.5 kg (5.5 lb)
Size	Not publicly disclosed	13.02 x 6.69 x 5.9 in	25 cm x 8 cm (9.8 x 3.1 in)
Sample size accuracy	8 samples per entry	N/A	±7%
Feedback system	transfers samples from the tool to a flask	Live stream camera	Manual gauge
Sampling time	50% more efficient than previous methods	max speed: 9 m per min (travelling)	10 min
Cost	Not publicly disclosed	CAD \$75,455.00	\$1,200
Operating temperature	Temp varies, however has no need for ice plugs or heating	0°C to 45°C	-15°C to 55°C
Fail-safe	designed for easy retrieval and reset	N/A	Manual reset

## Evaluation of each specification

Legend: **Bad** **OK** **Great** **N/A**

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## Weight of each specification

Scale from 1-3

Specifications	<i>Kinectrics CWEST</i>	<a href="#"><i>VersaTrax VT205</i></a>	<i>Diesel</i>
Weight	-	1	3
Size	-	2	3
Sample size accuracy	2	-	2
Feedback system	2	3	1
Sampling time	2	3	2
Cost	-	1	2
Operating temperature	2	2	3
Fail safe	3	-	3
Total	11	12	19

After researching several products and experimental research projects that relate to our design criteria, we have found three which stand out. From these we can take several main ideas and features as inspiration. We can finally conclude that the “Diesel” project should be referenced when completing our project.

## Target Specifications

	Design Specifications	Relation (=, <, >, ≈)	Value	Units	Verification Method
Functional requirements	Fit in CANDU fuel channel	=	104	mm	Measuring and testing
	Must reach a certain length in the pipe	=	4.572	m	Measuring and testing
	Suitable for both horizontal and vertical orientation	=	-	-	Testing
	Must retrieve a sample	=	-	-	Testing

Non-functional requirements	Designed for long term use	>	5	years	Accelerated lifetime testing
	Modular, lightweight for transport	<	10	kg	Weighing
	Tool free modular replacement	-	-	-	Assembly
	Auto shut off fail safe mechanism	-	-	-	Functional safety testing
	Comfortable and user-friendly	-	-	-	Operator feedback
Constraints	Sample	=	30-80	mg	Testing
	Cost	=<	100	\$	Tracking expenses, budgeting

### **Client Meeting Reflection**

The client meeting was crucial in determining design criteria and specifications. Our design criteria are mainly based on the needs expressed by the client during the meeting. However, a few of the design criteria on our list were not explicitly stated by the client, but were interpreted based on the background that the client gave of the company during the meeting. Considering the list of client needs and our observations during the meeting, we determined the relative importance of each criteria. We then created a table of target specifications to refer to when developing our design. The specifications were divided into three sections: functional, non-functional, and constraints. The design criteria were then organized into the table to ensure that we know exactly what we need our product to do.