
NEEDS IDENTIFICATION AND PROBLEM STATEMENT

Deliverable B

Client – Canadian Nuclear Laboratories

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THE MOMENT – GROUP 15

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Introduction:

CANDU reactors are heavy water pressurized nuclear reactors used all over Canada. These reactors utilize a mass fuel pipe system to feed their operation. The Canadian Nuclear Safety Commission has strict rules for the operation of pressure retaining structures and systems, stating that they should be classified, designed, fabricated, inspected and tested in accordance with established standards. For this reason, the Canadian Nuclear Laboratories needs a system designed to collect sample material from inside the various fuel pipes for inspection and testing. This report is an analysis of the client's needs taken from the client meeting, as well as a breakdown of user experiences with similar working products. To better understand the criteria for an effective solution.

Needs Identification:

Importance	User Need	Justification	Statement
5	Retrieve 30–80 mg of radioactive material from a pipe	This is the main goal of the product, making it the highest priority.	Product can efficiently retrieve radioactive material from a tube.
5	Function safely to avoid contamination	Safety is critical. Without it, retrieving radioactive material cannot happen safely or effectively.	Product will include safety measures to prevent contamination.
5	Be portable	The product must be easy to transport, reducing time and effort during operations.	Product will be lightweight and portable for efficient transportation.
4	Work in horizontal and vertical orientations	Pipes vary in orientation. The product needs to function regardless of how the pipe is positioned.	Product will operate in both vertical and horizontal tubes.
4	Include a failsafe in case of system failure	Failures happen. A failsafe ensures no harm to the operator and prevents further issues.	Product will include failsafe mechanisms for safety.
3	Provide operator feedback	Feedback helps the operator know what's happening (e.g., entering the pipe, extracting material).	The product will provide operator feedback for better efficiency and safety.
2	Accommodate slight deviations	Pipes won't always be perfect, so the product should handle small irregularities.	Product will adapt to slight deviations in pipe structure.
1	Be battery-powered or man-powered	The product needs reliable power. While battery power is ideal, having a manual option is a nice backup.	Product will primarily use batteries but can also be man powered.

Problem Statement:

A need exists for the Canadian Nuclear Laboratories to safely extract sampling material from within a radioactive fifteen-foot long by four inches wide pipe, with an innovative device that is portable, fail-proof and ensures zero contamination of the sample into the surroundings.

User Benchmarking:

DOMINOX Electric Drain Snake:

Usage: Unclogging sewage and drainpipe systems.

Most common positive remarks:

- Mobility – the product advances and retracts fast and easily turns sharp corners.
- Comfort – the product is light, portable and automatic making it easier to handle.

Most common negative remarks:

- Snake is made from a spring; so, it is not very powerful to push through materials, so it tends to bend around material instead of removing it.
- Battery does not last a long time and sometimes does not provide enough power to unclog pipes.

ONE+ Cordless Drain Auger:

usage: Unclogging sewage and drainpipe systems.

Most common positive remarks:

- Auto feed feature is extremely rewarding but has a manual feed option for backup.
- Easy to hold up to the drain mouth.
- Cheap.
- Does not require any previous experience or knowledge.

Most common negative remarks:

- The locking mechanism does not provide a strong enough lock.
- Not enough tension in the snake, making it whip around.
- Snake snaps under some resistance.
- Not enough power to rotate once the snake is extended.
- Hard to maneuver through corners.
- Cable rusts easily.

RIDGID 1/4 in. x 25 ft Power Spin:

Usage: Unclogging sewage and drainpipe systems.

Most common positive remarks:

- Very effective constant automatic feed system
- Can be both hand powered and electrically powered.
- Easily maneuver through corners.

Most common negative remarks:

- There is very weak connection between snake and base, causing easy separation.

- Hard to pull out if it gets stuck.
- No warning when it reaches the end of the snake and ends up breaking.
- Cheap plastic material, but expensive overall tool.

Overall take aways from user benchmarking:

An effective solution based on user reviews should have fast extension and contraction, a lightweight and portable design, a durable extender, automatic feeding system, easy fail-safe retraction, easily maneuverable design and long durability.

Conclusion:

Overall, the proposed needs of the Canadian nuclear laboratories hold much importance, being crucial to understanding exactly what the customer needs. In aim to solve the problem successfully we believe some needs hold more priority than others, and are treated as more important, to achieve the best product for the customer. Another important aspect is user benchmarking to fully understand the most important aspects of the product for the users, but to also take inspiration from other products to create something that can build on those ideas or improve them. In the process of benchmarking much influence was taken on drainage systems as they relate to the cleansing of pipes and delicate operations which our product may entail.