


Image of our completed poster board:

# Thinker Titans


GROUP 10

## Metal Sampling Inside a Tube




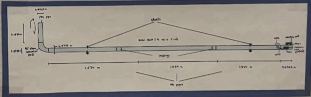
Canadian Nuclear  
Laboratories  
Laboratoires Nucléaires  
Canadiens

**Problem Statement:**  
There is a need for a tool that will allow nuclear engineers to scrape and collect a metal sample 4.572 m from the inlet of a fuel channel with a diameter of 101.6 mm. The sample will be able to be extracted from the device.



uOttawa

### About our design

**The Solution**

- A simple manually rotated cylindrical device
- Blade on the end above the storage container
- Removable storage container
- Funnel-like system to collect all samples at all orientations

The device is of great value to the customer as it provides a cheap yet effective and very simple solution to a complex problem.

**Client Feedback**

Message	Adjustments made
<b>Scraper substitution</b> Original concept was too complicated (and not very feasible) Should use a rotating blade instead of trying to make a new design	Changed to use a simple blade
<b>Body of the design</b> Overlooked the rotation of the device if the body was telescopic (could not rotate properly)	Three concentric bodies that can be connected and taken apart using pins
<b>Motor</b> Motor may not be strong enough, budget issues Metal sample may not be detected by the sensor	Switched to manual rotation of the tool Infrared touch sensor that we have not tested
<b>Feedback system</b> Whether it would be able to collect and contain material in all orientations	Added a funnel that is open to the collection device in order to collect vertically
<b>Mounting in</b> Motor would be difficult to manually rotate the device and now requires multiple people	Changed to manual tool to make it easily used
<b>Scraper</b> Blade may not hold up after multiple uses	Got into additional system to hold

**Other Considerations**  
When designing the pipe scraper there were some things we needed to consider outside of the functionality and cost

Ethical concerns

Environmental considerations:

- Recyclability: PVC is recyclable, it can be reprocessed and repaired rather than contributing to landfill waste
- The wires, armbands and threadboard are all reusable

Safety and Security:

- The safety of the user as the device depends on manual scraping and physical labour
- Operators must be trained on safe lifting, transport and operation of the 15 foot long tool to prevent workplace accidents
- Operators must use protective equipment such as gloves, safety goggles and protective clothing to ensure safety in case of accidents
- Tool can be disconnected into three pieces for safe, easy and secure storage

**Bill of materials**

Material	Quantity	Cost
Strip blades	1	1.25
PVC tubes	4	19.92
Edge2	1	13.99
Touch sensor	1	12
Breakdown	2	2.5
Coupling	1	0.01
45 degree PVC Elbow	2	4.95
Fluorescent - 3D printing	1	2.98
<b>Total Cost After Tax</b>	<b>128g</b>	<b>16.64</b>
		<b>\$103.01</b>