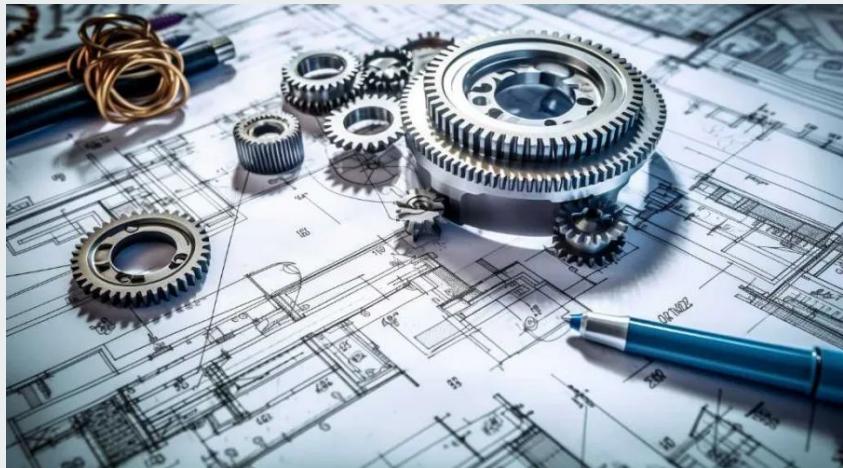

PORTFOLIO

Abhi Shah



Underground Restaurant Drive Thru

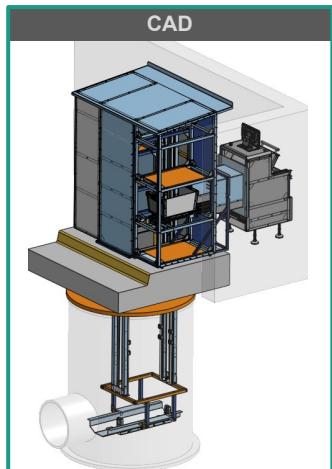
REQUIREMENTS: Deliver orders from inside the kitchen to a temperature controlled Cache outside through an exterior wall and then underground to a AUTTR

AUTTR - Autonomous Underground Tote Transportation Robot

RESPONSIBILITIES: Product owner and mechanical engineer for Input Portal and Caching System
Industrial Design, Mech. Design, Project Planning, Controls Planning, Testing, Assembly

RESULTS:

- Successfully passed the equivalent of two months of continuous use testing, ensuring long-term durability
- Designed an electrical box with a slider and cam-lock mechanism for easy access and secure operation
- Developed a custom spring-loaded plunger mechanism for controlled engagement
- Integrated a stepper-actuated belt and pulley system with encoder, hall-effect, flag, beam break, and proximity sensors for precise positioning and feedback
- Created a CAD Master Model for the entire system, streamlining subsystem integration and design consistency



Baseball 4 Way Junction

REQUIREMENTS: Enable AUTTR to selectively traverse straight, right, or left based on controlled path selection

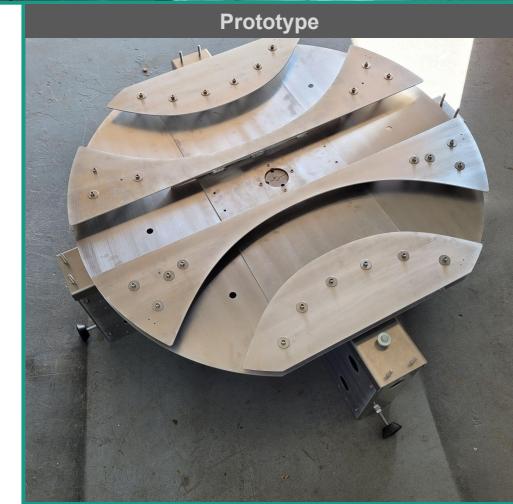
AUTTR - Autonomous Underground Tote Transportation Robot

RESPONSIBILITIES: End to End Mechanical development:
Requirements Document, Project Scheduling, Mech. Design, Controls
Planning, Assembly and Testing

RESULTS:

- A baseball-style turntable pre-positions the tracking sub-1-second, eliminating the need for the AUTTR to slow down or stop
- Engineered for seamless assembly and disassembly within underground vaults, ensuring future upgradability
- Integrated a stepper motor with a gearbox to achieve a balance of speed and torque
- Implemented a flexible coupler to absorb entry impact, reducing mechanical stress
- Designed with a continuously variable turn radius, enabling fine-tuned control over entry and exit profiles
- Equipped with flag sensors for homing and position confirmation

Product Testing Video



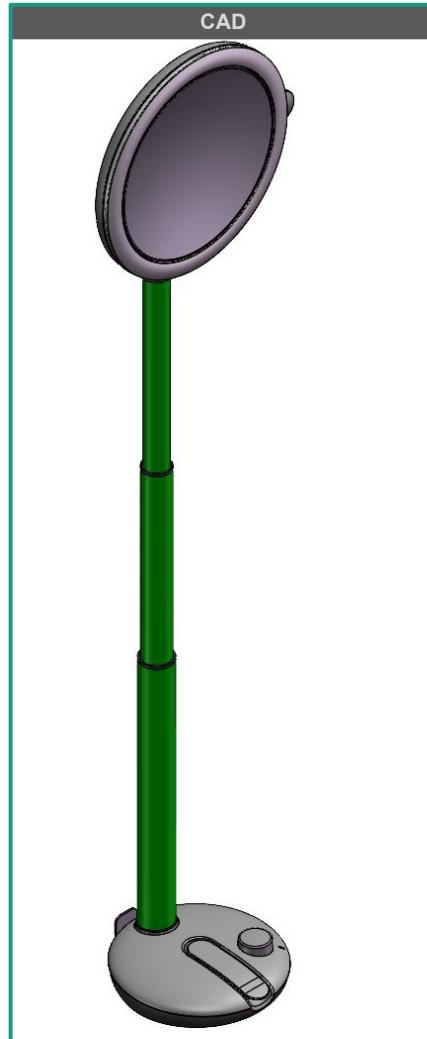
Cosmetic Mirror

REQUIREMENTS: Luxury Cosmetic Mirror with dual magnification, LED ring with adjustable brightness, a long telescopic adjustability

RESPONSIBILITIES: Worked closely with Industrial, Electrical and Firmware engineers. Developed requirements, project scheduling, mechanical design, vendor management and client meetings

RESULTS:

- [Product Website](#)
- Engineered a suction cup utilizing cams, levers and springs.
- Designed a synchronized tri-section telescopic arm with integrated power and data
- Enabled infinite non-index stopping and fine-tuned friction for controlled ergonomics
- Designed a swivel joint with three degrees of freedom while maintaining power and data continuity
- Developed an LED ring with an ultra-shallow throw and no visible hotspots
- Utilized 3D printing, injection molding, wire edm, die casting, machining, overmolding, anodizing and extrusion



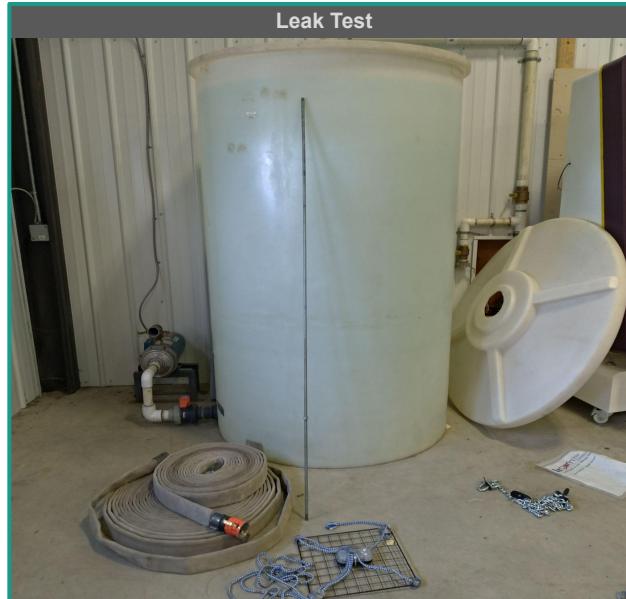
Personal Dual Gas Detector

REQUIREMENTS: A handheld dual gas detector

RESPONSIBILITIES: Industrial Design, Mechanical Design, vendor development, testing, documentation and client relationship

RESULTS:

- Engineered to detect CO and H₂S with high accuracy
- Led industrial and mechanical design, overseeing manufacturing from concept to 10K units/year production
- Designed and tested to meet IS and CSA standards
- Conducted drop, leak (IP67), impact, and thermal endurance testing to ensure reliability in harsh environments
- Utilized injection molding, overmolding and snap-fit mechanism



Graft Tissue Injector and Storage

REQUIREMENTS: End to end mechanical development of a custom syringe, adapter and storage container for cornea graft tissue

RESPONSIBILITIES: Industrial Design, Mechanical Design, vendor development, testing, documentation and client relationship

RESULTS:

- Co-inventor of U.S. Patent # [11957569](#) ; [20200276010](#)
- **Top Image:** Cornea Graft Tissue storage. Designed a cornea graft storage system that suspends tissue between two liquid membranes, enabling real-time health inspection under a microscope
- **Bottom Image:** Developed a custom syringe with a specialized adapter for controlled graft tissue delivery and extraction
- Utilized cleanroom manufacturing, sterilization, and packaging to meet stringent medical standards
- Worked with patent lawyers and surgeons to refine the design and ensure clinical feasibility



ICON Wire Chain Spool

REQUIREMENTS: Simplify 800 lbs of cable chain spooling and transportation

RESPONSIBILITIES: Developed and presented several options at different levels of cost, automation and manufacturing techniques. Designed one from idea to product.

RESULTS:

- Designed a pawl and ratchet mechanism to enable two-way drive while preventing unintentional backdrive from cable chain weight
- Engineered a balanced gearbox for efficient single-person operation with minimal rotations.
- Integrated a caster with a locking mechanism on one side and a V-groove wheel for guided movement along 3D printer rails
- Designed forklift points for seamless loading and unloading
- Implemented a manual lockout mechanism for added operational security



Cost Reduction - Laser Fat Removal Belt

REQUIREMENTS: End to end mechanical development of a custom syringe, adapter and storage container for cornea graft tissue

RESPONSIBILITIES: Industrial Design, Mechanical Design, vendor development, documentation and client relationship

RESULTS:

- Achieved 40% cost reduction for client on injection molded parts while keeping the same vendor in China and re-designing the product enclosure



Android-Cam

REQUIREMENTS: End to end mechanical development of a custom syringe, adapter and storage container for cornea graft tissue

RESPONSIBILITIES: Industrial design, mechanical design, vendor development, documentation and client relationship

RESULTS:

- Backup camera module - Allowed off the shelf backup camera to work with android phones seamlessly.
- [Product Video on YouTube](#)



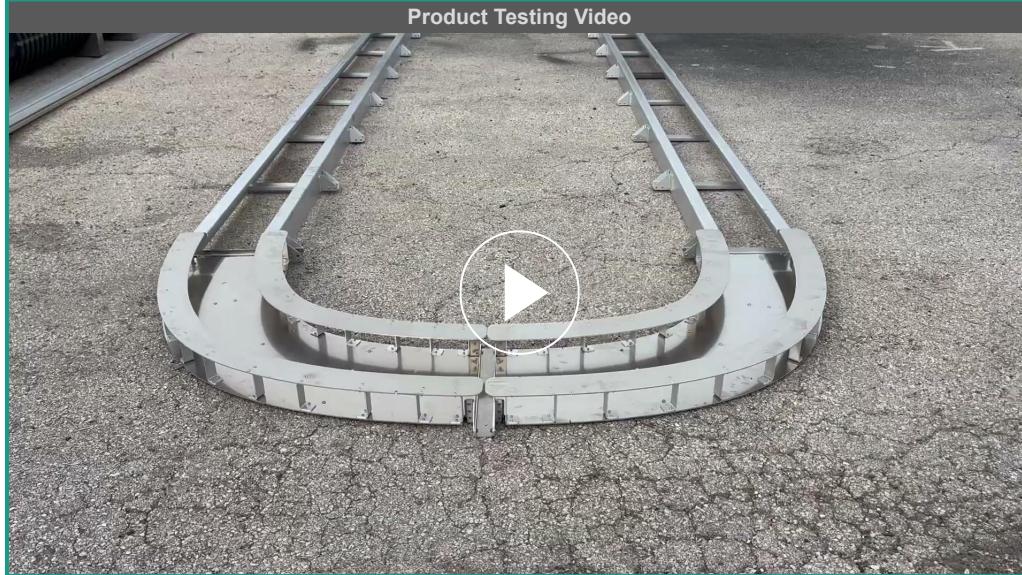
Torture Track

REQUIREMENTS: Stress test the cart on allowable install tolerances. Test cart cornering on different entry and exit profile.

RESPONSIBILITIES: End to End Mechanical development:
Requirements Document, Project Scheduling, Mech. Design and Assembly

RESULTS:

- Designed four corner profiles with varying entry and exit geometries to analyze cart dynamics at different speeds and turn radii
- Engineered vertical and horizontal offsets at defined values to evaluate the behavior of magnetic suspensions under controlled stress conditions



Pull Test Rail Bracket

REQUIREMENTS: Rail Joiner should be able to withstand a pull force of pulling full length of rails without being damaged while allowing compliance and low cost.

RESPONSIBILITIES: Designed the bracket but also designed and conducted the stress test

RESULTS:

- Enabled 2 degrees of freedom to conform to the pipe
- Optimized for affordability while meeting structural integrity requirements
- Designed to support loads exceeding 2,500 lbs



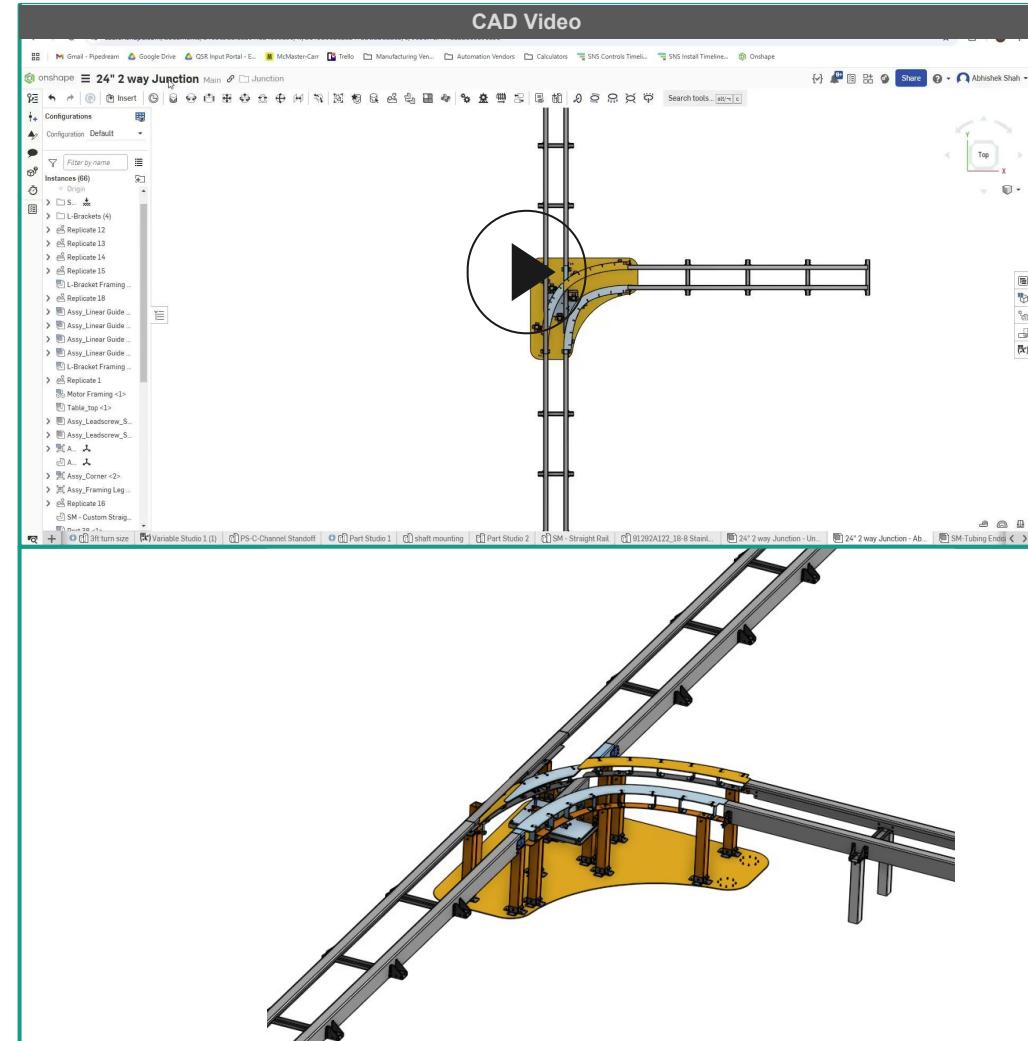
Track Switcher

REQUIREMENTS: System that enables a cart to selectively traverse straight or right based on controlled path selection.

RESPONSIBILITIES: End to End Mechanical development:
Requirements Document, Project Scheduling, Mech. Design, Controls
Planning, Assembly and Testing

RESULTS:

- Smaller footprint than a 4-way junction, enabling installation in tighter spaces
- Utilizes stepper motors with lead screws and flag sensors for accurate endpoint confirmation
- Engineered to support up to 100 lbs
- Planned mechanical linkage to synchronize track movement, preventing simultaneous actuation errors
- Turn geometry informed by insights from torture track testing for improved reliability



Custom ERP System



REQUIREMENTS: Wanted to learn HTML and JavaScript

RESPONSIBILITIES: Learn HTML and JavaScript

RESULTS:

- Built a custom ERP system using Google Sheets, Apps Script, HTML, and JavaScript
 - Creates structured and flattened BOMs with seamless OTS part integration
 - Generates unique part numbers and enforces standardized naming conventions based on part type
 - Enables easy addition of new vendors for streamlined procurement

A - Steak n Shake Project										
A	B	C	D	E	F	G	H	I	J	K
Item #	P/N#	Part Name	Quantity	Vendor	Part Type	Material	Links	Manufacturing Notes	L	M
1	50001		1	Pipedream Labs	Custom Assembly	N/A	50001-A-.htm			
2	50002-A	Input_Portal	1	Pipedream Labs	Custom Assembly	N/A	50002-A-.htm			
3	50003-A	Input_Board_Drawer	1	Pipedream Labs	Custom Assembly	N/A	50003-A-.htm			
4	5247950	O - NON ST LENGTH 2.0mm KUSTOMPL 600mm CG	1	Solenic Inc.	Off the Shelf	HDPE	5247950-A-.htm			
5	50004-A	Input_Case_Primacy	1	Pipedream Labs	Custom Assembly	N/A	50004-A-.htm			
6	50005-A	Input_Ventil_Gasket	1	Solenic Inc.	Off the Shelf	HDPE	50005-A-.htm			
7	5024845	O - INPUT VAULT CATCH BASH KUSTOMPL 1500mm V	1	Pipedream Labs	Custom Assembly	N/A	5024845-A-.htm			
8	P2024845	O - INPUT VAULT CATCH BASH KUSTOMPL 200mm v	1	Solenic Inc.	Off the Shelf	HDPE	P2024845-A-.htm			
9	50006-A	Input_Ventil_Gasket	1	Solenic Inc.	Off the Shelf	HDPE	50006-A-.htm			
10	50007-A	Input_Ventil_Gasket	1	Solenic Inc.	Off the Shelf	HDPE	50007-A-.htm			
11	50008-A	Input_Ventil_Gasket	1	Solenic Inc.	Off the Shelf	HDPE	50008-A-.htm			
12	50009-A	P_Rail_Juster	10	Sundstrand	Custom Part	AL 5652	50009-A-.htm	Sheetmetal + Bonding		
13	50010-A	P_Rail_Juster	10	Sundstrand	Custom Part	AL 5652	50010-A-.htm	Sheetmetal		
14	50011-A	Access_Vault_Lid	1	Solenic Inc.	Off the Shelf	HDPE	50011-A-.htm			
15	5247950	O - CAP_WITH_PLATE FOR KUSTOMPL 600mm	1	Solenic Inc.	Off the Shelf	HDPE	5247950-A-.htm			
16	50012-A	Input_Case_Primacy	1	Pipedream Labs	Custom Assembly	N/A	50012-A-.htm			
17	50013-A	Input_Ventil_Gasket	1	Pipedream Labs	Custom Assembly	N/A	50013-A-.htm			
18	160013	O - Saapelite Vladment, INPUT	1	Pipedream Labs	Custom Assembly	N/A	160013-A-.htm			
19	3416172	O - Non-Standard HDPE Enclosure_Kustompl_EPM00	1	Monster Carr	Off the Shelf	HDPE	3416172-A-.htm			
20	50014-A	Input_Ventil_Gasket_Front	1	Pipedream Labs	Custom Assembly	N/A	50014-A-.htm			
21	50015-P	Input_Ventil_Gasket_Enclosure_Front	1	Olecko	Custom Part	SS 304	50015-P-.htm			
22	16016-P	Input_Ventil_Gasket_Enclosure_Back	1	Olecko	Custom Part	AL 5661	16016-P-.htm			
23	50017-A	Input_Ventil_Gasket_Enclosure_Bottom	1	Pipedream Labs	Custom Assembly	N/A	50017-A-.htm			
24	16018-A	Input_Case_Primacy_Enclosure_Front	1	Pipedream Labs	Custom Assembly	N/A	16018-A-.htm			
25	16019-A	Input_Case_Primacy_Enclosure_Side	1	Pipedream Labs	Custom Assembly	N/A	16019-A-.htm			
26	50020-A	Input_Ventil_Gasket_Enclosure_Side	1	Pipedream Labs	Custom Assembly	N/A	50020-A-.htm			
27	91263440	O - 18.5 Stainless Steel Socket Head Screw	6	Monster Carr	Off the Shelf	N/A	91263440-A-.htm			
28	91263441	O - 18.5 Stainless Steel Socket Head Screw	6	Monster Carr	Off the Shelf	N/A	91263441-A-.htm			
29	91263442	O - 18.5 Stainless Steel Socket Head Screw	4	Monster Carr	Off the Shelf	N/A	91263442-A-.htm			
30	91263423	O - 18.5 Stainless Steel Socket Head Screw	4	Monster Carr	Off the Shelf	N/A	91263423-A-.htm			
31	50021-A	Sealing_Band_Rings_18.5mm_Steel_Domed_Head	24	Monstar	Off the Shelf	N/A	50021-A-.htm			
32	50022-A	Sealing_Band_Rings_18.5mm_Steel_Domed_Head	24	Monstar	Off the Shelf	N/A	50022-A-.htm			
33	50241453	O - Sealing_Band_Rings_18.5mm_Steel_Domed_Head	128	Monstar Carr	Off the Shelf	N/A	50241453-A-.htm			
34	50023-A	Sealing_Band_Rings_18.5mm_Steel_Domed_Head	3							

Part Card

Part Type:	Custom Part	<input type="button" value="Copy"/>
Part Number:	10058	<input type="button" value="Copy"/>
Part Name:	P - Steak 'n Shake Project.	
Mfg Process:		
Vendor:	Misumi	<input type="checkbox"/> Add New Vendor
Material:		
Quantity:	1	
<input type="button" value="Submit and Wait Patiently"/>		