KGCOE MSD Technical Review Agenda

P11712: Cheesecake Water Dosing Automation

Meeting Purpose:

1) Overview of the project
2) Confirm Engineering Specifications and Customer Needs
3) Review concepts
4) Propose a design approach and confirm its functionality
5) Cross-disciplinary review: generate further ideas

Materials to be Reviewed:

1) Project Description
2) Work Breakdown Structure (R#2)
3) Project Plan
4) Customer Needs
5) Engineering Specifications
6) Concept Development
7) Proposed Design
8) Risk Assessment

Meeting Date: January 14, 2011

Meeting Location: Wegmans Facility

Meeting time: 10:00 am – 11:00 am

Timeline:

Meeting Timeline		
Start time	**Topic of Review**	**Required Attendees**
10am	Project and Team Introduction	
10:00	Work Breakdown Structure	
10:10	Project Plan	
10:15	Customer Needs and Engineering Specifications	
10:20	Concept Development	
10:30	Proposed Design	
10:45	Risk Assessment	
10:50	Questions	

Project #	Project Name	Project Track	Project Family
P11712	Cheesecake Water Dosing Automation	Process Innovation	Wegmans Process Innovation
Start Term	**Team Guide**	**Project Sponsor**	**Doc. Revision**
20102	Professor Kaemmerlen	Wegmans	

Project Description

Project Background:

The cheesecake baking process at Wegmans manufacturing facility requires a specific water dosing step. Cheesecake batters are filled into the cheesecake pans, and then cheesecake pans are placed on a metal sheet pan. The number of cheesecake pans on the sheet pans depends on the size of the cheesecake pans. The baking recipe requires water to be added in the sheet pan to keep the cheesecake moisture consistent. Current process involves human interaction in filling to sheet pans with water and removing excess water from the pans after bake. The process is not user friendly and can be improved through RIT Senior Design.

Problem Statement:

Improve the current process of dosing sheet pans with water for the cheesecake baking process by automation. Design implements electrical and mechanical parts that regulate a water source and dispense water mechanically in the sheet pans with minimum human interaction. The design must not decrease current production efficiency.

Objectives/Scope:

1) Improve the water dosing process by introducing electrical and mechanical system.
2) Ensure the production of cheesecake is not delayed.
3) Ensure safety of the user and meets all production health regulation.
4) Additional implementation of water removal system to improve ergonomics.

Deliverables:

1) Automated water dispensing system that met cheesecake manufacturing requirements
2) New design, sketches, control theory, timing analysis, mechanical and electrical diagrams
3) Documentation including user manual, maintenance procedures, and parts detail.

Expected Project Benefits:

The current design uses the traditional human interaction of manually pouring the assigned amount of water into each individual sheet pan. The process is not efficient and requires constant human interaction with the production of each sheet. An alarm on the baking over is activated if the human interaction exceeds the oven requirement and slows down production. The benefits of this product include consistent and reliable timing of water dosing and minimum human interaction with each pan to remove the risk of contamination. The whole process will be made more ergonomic for users and maintenance.

Core Team Members:

- Geoffrey Cresswell
- John Janiszewski
- Noah Mauer
- Joel Sack
- Tuo Shen
- Rodrigo Velarde – Project Manager

Strategy & Approach

Assumptions & Constraints:

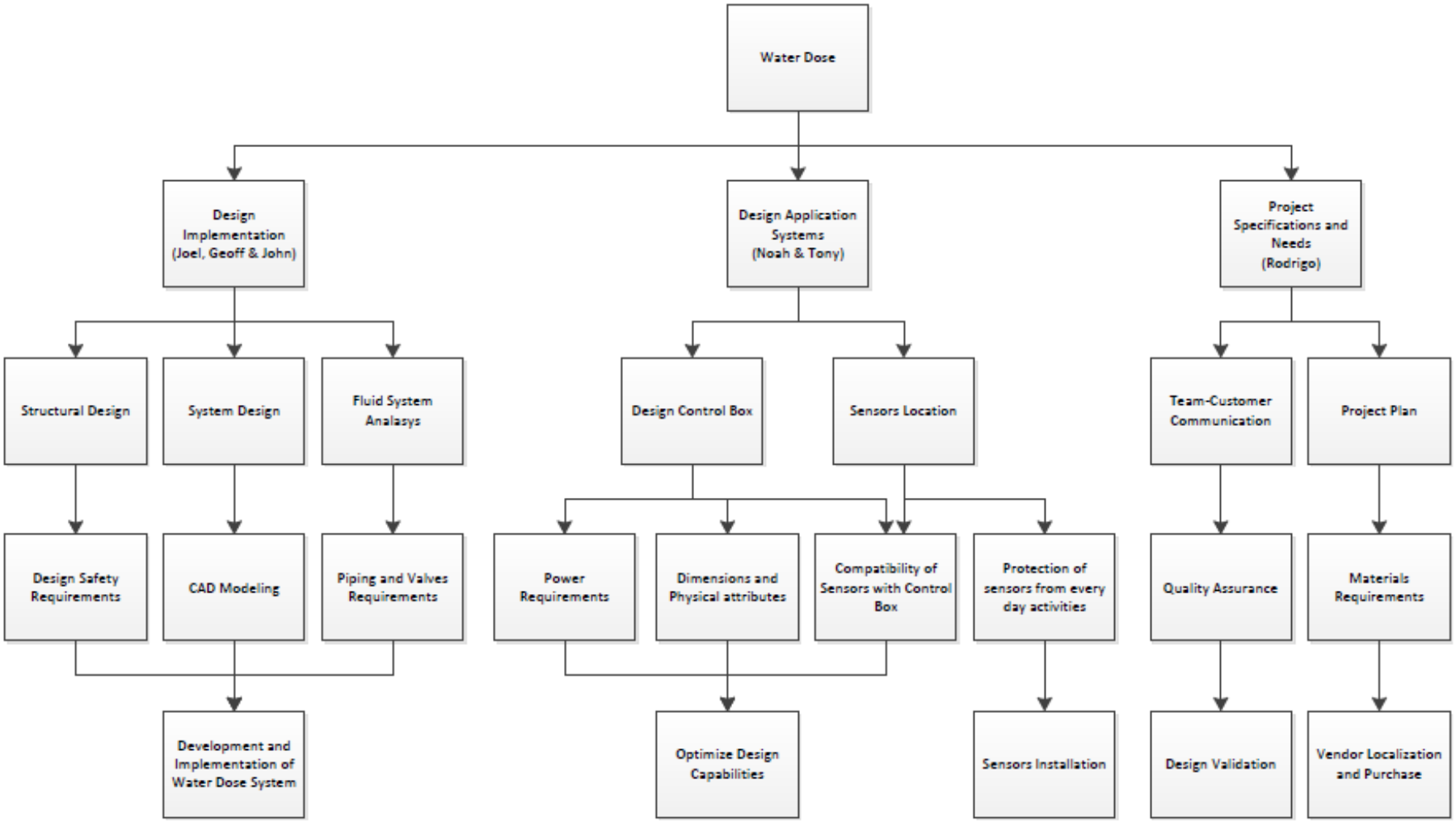
The mean must understand the current manufacturing process along with the new plans for manufacturing line addition. The production of the cheesecake must not be slowed down by the additional of the water dosing system. The ability to design a water extraction system can be limited by the amount of time available. The water dosing system is the main objective, and the water extraction system is a secondary objective. The team will focus on the integration of the design onto the new production line that is expected in May 2011.

Issues & Risks:

1) Difficulty of water output rate.
2) Parts and hardware requirements that could be implemented to current process.
3) Preserve Health and Safety Standards.

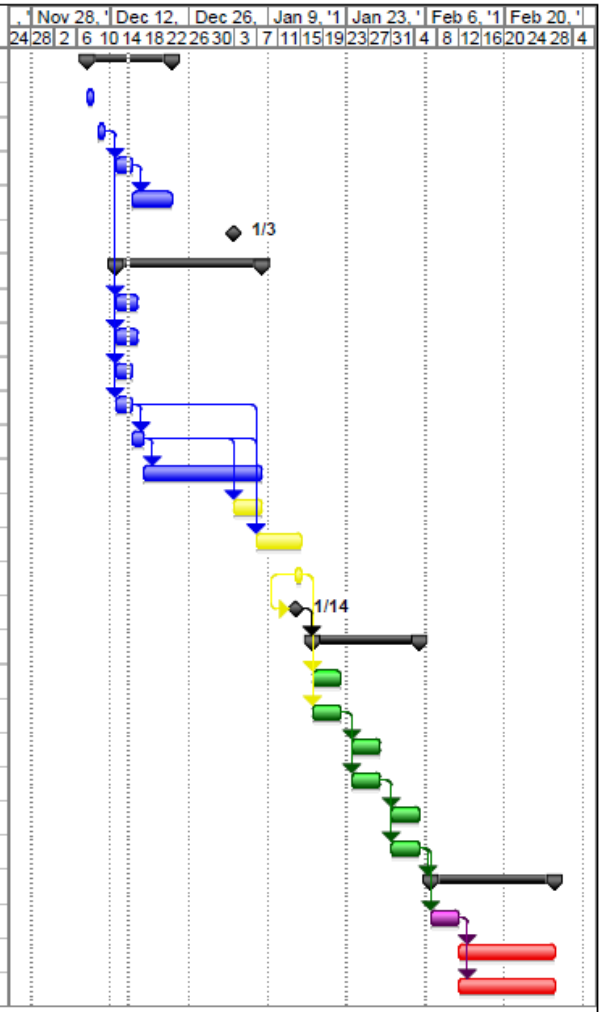
P11712: Cheesecake Water Dosing Automation

P11712 Work Breakdown Structure



P11712 Project Plan

ID	Task Name	Duration	Start	Finish	Predec	Resource Names
1	**Project Initiation**	**12 days?**	**Wed 12/8/10**	**Wed 12/22/10**		
2	Initial Project Meeting	1 day	Wed 12/8/10	Wed 12/8/10		
3	Wegmans Safety Training	1 day?	Fri 12/10/10	Fri 12/10/10		
4	Norms and Values	3 days	Mon 12/13/10	Wed 12/15/10	3	
5	Intial Observation and Data Gathering	6 days	Thu 12/16/10	Wed 12/22/10	4	
6	Return From Winter break	0 days	Mon 1/3/11	Mon 1/3/11		
7	**Analysis + Design**	**22 days?**	**Mon 12/13/10**	**Fri 1/7/11**		
8	MSD 1 Project Plan	4 days?	Mon 12/13/10	Thu 12/16/10	3	
9	Customer Needs	4 days	Mon 12/13/10	Thu 12/16/10	3	
10	Engineering Specifications	3 days	Mon 12/13/10	Wed 12/15/10	3	
11	Concept Generation and Evaluation	3 days	Mon 12/13/10	Wed 12/15/10	3	
12	Concept Improvement and Selection	2 days	Thu 12/16/10	Fri 12/17/10	11	
13	Systems Analysis	17 days	Sat 12/18/10	Fri 1/7/11	12	
14	Risk Assesment - System Design Phase	5 days	Mon 1/3/11	Fri 1/7/11	12	
15	System Design	7 days	Fri 1/7/11	Fri 1/14/11	12,11	
16	System Design Review Execution	1 day	Fri 1/14/11	Fri 1/14/11		
17	Last date to make changes to Project contract.	0 days	Fri 1/14/11	Fri 1/14/11	16SS	
18	**Design Validation**	**15 days**	**Mon 1/17/11**	**Fri 2/4/11**	17	
19	Drawings/ Schematics	5 days	Mon 1/17/11	Fri 1/21/11	16	
20	Knowledge of Design	5 days	Mon 1/17/11	Fri 1/21/11	16	
21	Feasibility Analysis	5 days	Mon 1/24/11	Fri 1/28/11	20	
22	Risk Assesment - Desing Phase	5 days	Mon 1/24/11	Fri 1/28/11	20	
23	Plan to Meet Customer Needs	5 days	Mon 1/31/11	Fri 2/4/11	22	
24	Bill of Materials	5 days	Mon 1/31/11	Fri 2/4/11	22	
25	**Project Wrap up**	**17 days**	**Mon 2/7/11**	**Mon 2/28/11**	24	
26	Detailed Design Review	5 days	Mon 2/7/11	Fri 2/11/11	24	
27	Risk Assesment Update	12 days	Sat 2/12/11	Mon 2/28/11	26	
28	Design History File on website	12 days	Sat 2/12/11	Mon 2/28/11	26	



Project: MSD Project Plan
Date: Wed 12/15/10

Task
Split
Progress
Milestone
Summary
Project Summary
External Tasks
External Milestone
Deadline

P11712 Customer Needs

Revision #:	1	Water Dousing System	
Customer Need #	**Importance**	**Description**	**Comments/Status**
		Fully Automated System	
1	1	No human interaction	
2	1	Ergonomic setup is ideal for operators	
		Functionality	
3	1	System must operate when in position	
4	1	System must keep on pace with current production	
5	2	System set up must be user friendly	
		Cost	
6	1	Needs to be within budget	
7	2	Repair components are inexpensive	
8	2	System should consume minimal energy	
		Safety and Quality	
9	1	Materials used need to be food safe	
10	1	Will not harm operators	
11	1	Will not spill any water	Wet floors are a large safety concern
12	1	Will consistently dispense the correct amount of water	Water insures uniform baking
		Maintenance	
13	1	Easy to maintain/repair	
14	1	Has the ability to be programmable	
15	2	Minimum maintenance/downtime	
16	2	Documentation/Training Guide	For Maintenance and worker help
		Capacity	
17	1	Has the ability to hold enough water in order to perform task at hand	
18	1	Has the ability to be filled with water whenever needed	
19	1	Can be filled quickly in between down time	
		Stability	
20	1	Will remain stable while performing task	
21	1	System will not fall apart due to motion of performing task	
		Manipulation	
22	1	Easily to clean	
23	2	Can be easily broken down to move and store if needed	
		Durability	
24	1	System needs to stand up to physical abuse	
25	1	System must withstand exposure to water/heat	

Cust. Need #: enables cross-referencing (traceability) with specifications

Importance: Sample scale (1=must have, 2=nice to have, 3=preference only), or see Ulrich exhibit 4-8.

Description: organize as primary and secondary needs (hierarchy) -- Ulrich exhibit 4.8

Comment/Status: allows tracking of questions, proposed changes, etc; indicate if you are meeting the need ("met") or not ("not met")

P11712 Engineering Specifications

Revision # 1			Water Dousing System				
Engr. Spec. #	Importance	Source (CN#)	Specification (description)	Unit of Measure	Marginal Value	Ideal Value	Comments/Status
Fully Automated System							
1	1	1	Zero human interaction when loading and unloading occurs	person/task	1	zero	
2	1	2	Zero amount of bending, twisting, lifting, and turning	degrees	15	zero	
Functionality							
3	1	3	Robust, Reliable and Dependable	downtime/week	60 min/week	40 min/week	
4	1	4,17	Maximum of 40 seconds to fill the 8th pan	seconds	40	35	
5	2	5	System can be set up and torn down quickly	minutes	60	45	
Cost							
6	1	6	Budget set to $40,000	dollars	$40,000	$25,000	
7	2	7	Components are off the shelf components and minimal lead time	day/weeks	2 weeks	1 week	
8	2	8	System requires minimal energy to run	KW	NA	NA	
Safety and Quality							
9	1	9	Material is "food grade" for production	Material grade	"food grade"	"food grade"	
10	1	10	Minimal accidents while working with system	accidents/month	zero	zero	
11	1	11,12	Will not spill more than 1/2 cup of water per pans	cups	0.5	zero	
12	2	12	System will consistently dose 2.5 quarts of water per pan	Variance in cups	± 2	± .5	
Maintenance							
13	1	13,15,16	Minimal time needed for repairs	hours	1 hour	1/2 hour	
14	1	13	Insure small components fail before large components to insure low cost for repairs	dollars	$200	$100 or less	
15	2	13,16	Repairs can be fixed by one person	person / # of repairs	2 people	1 person	
16	2	13,16	Minimal amounts of steps needed for repairs	steps/repair	5 step	1 step	
17	2	13,16	Minimal special training needed for repairs	hours of training	3 hours	1 hour	
18	1	13	No specialty tools needed to fix system	tools	Standard Parts	Standard Parts	
19	2	13	Components are readily accessible	space (inches)	6 inches/part	12 inches/part	
20	1	14	Control systems and its components are adjustable for many setup configurations	NA		NA	
21	2	14	Control system is easily integrated into existing system	NA		NA	
Capacity							
22	1	17	Minimum of 21 quarts of water deliverable from system	quarts	21	24	
23	1	18	System can hook up to main water line or water source for filling	NA	NA	NA	
24	1	19	System can aquire 21 quarts of water in under 4 minutes	minutes	4	3	
Stability							
25	1	20	Will not have excessive vibration/translation/rotation while performing job	NA	NA	NA	
26	1	21	Components will remain intact and properly working while performing task	NA	NA	NA	
Manipulation							
27	1	22	Removal of parts to clean will take minimal ammouts of time	minutes	60	30	
28	2	23	Time required to break down entire system to move and store	hours	1.5	1	
29	3	23	System is movable and adoptable to different parts of the line	hours	2	1	
Impact Resistance							
30	1	24	System needs to be able to take abuse from maintenance and operation	hours of operation/repairs		1700 hrs./repair	1 year of operation,
31	2	24	System needs to be able to take an impact from a forklift	pounds of force		500 pounds of force	
32	1	25	System must be built of water and heat resistant materials	Material		Rubber,Stainless, ect.	
Engr. Spec. #: enables cross-referencing (traceability) and allows mapping to lower level specs within separate documents							
Source: Customer need #, regulatory standard (eg. EN 60601), and/or "implied" (must exist but doesn't have an associated customer need)							
Description: quantitative, measurable, testable details							
*This table can be expanded to document test results							

P11712 Concept Development

The Pugh Diagram tool was used to identify and rate each concept according to their location benefits. An ideal location would facilitate the input of water to the system design, output of water to the cheesecake pans, adequate time to complete the job.

Pugh Diagram to see what avenue the water dousing syatem will take

Criteria	Value	Datum	Concept 1	Concept 2	Concept 3	Concept 4
Location of System	7		+	+	-	-
Input of Water to System	6		+	+	S	S
Outlet of Water to Pans	8		+	S	S	-
Adequate timing to complete the job	5		S	S	-	-
Zero Human Interaction	8		+	+	+	-
Ergonimic setup is ideal for operators	5		+	S	S	-
System set up is user friendly	7		+	S	-	S
Within Budget	8		S	S	S	S
Repairs costs are inexpensive	5		S	S	-	S
Minimal water spillage	8		S	S	S	S
Minimal repair time	6		S	S	-	S
System is safe for workers and other machinery	5		+	+	S	-
Easy to clean	5		S	S	S	S
Easily broken down to move and store	5		S	S	S	S
System stands up to physical abuse	7		S	S	S	S
System can withstand exposure to water and heat	5		S	S	S	S
	Total	+	7	4	1	0
	Total	-	0	0	5	6
	Total	Combined	7	4	-5	-6
	Weighted	Total	46	26	0	0

Legend: (Listed Respectivly from Criteria)

Datum: How the Process is Performed Currently

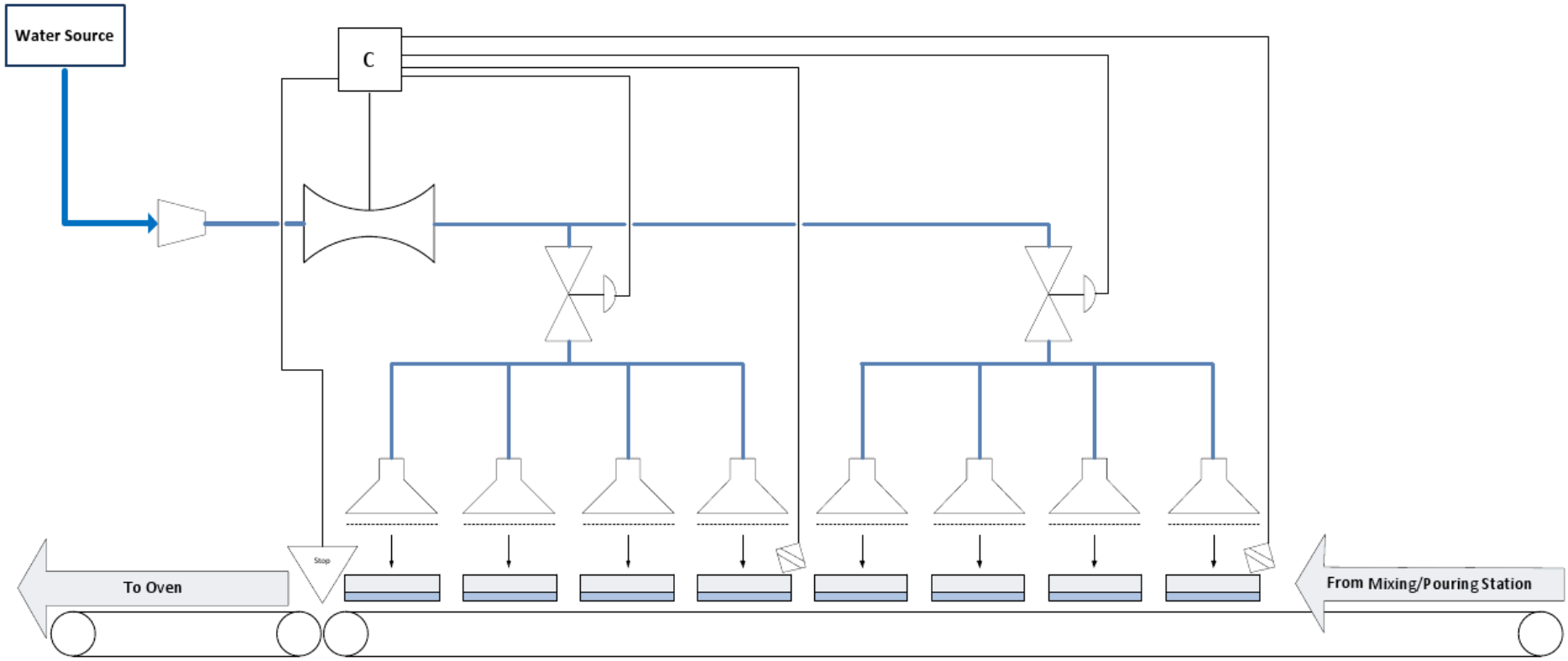
Concept 1: Cat Eye Location - HardPipe to Flex Pipe then to Unit - Dispense 4 - Variable Time (2 sensors)

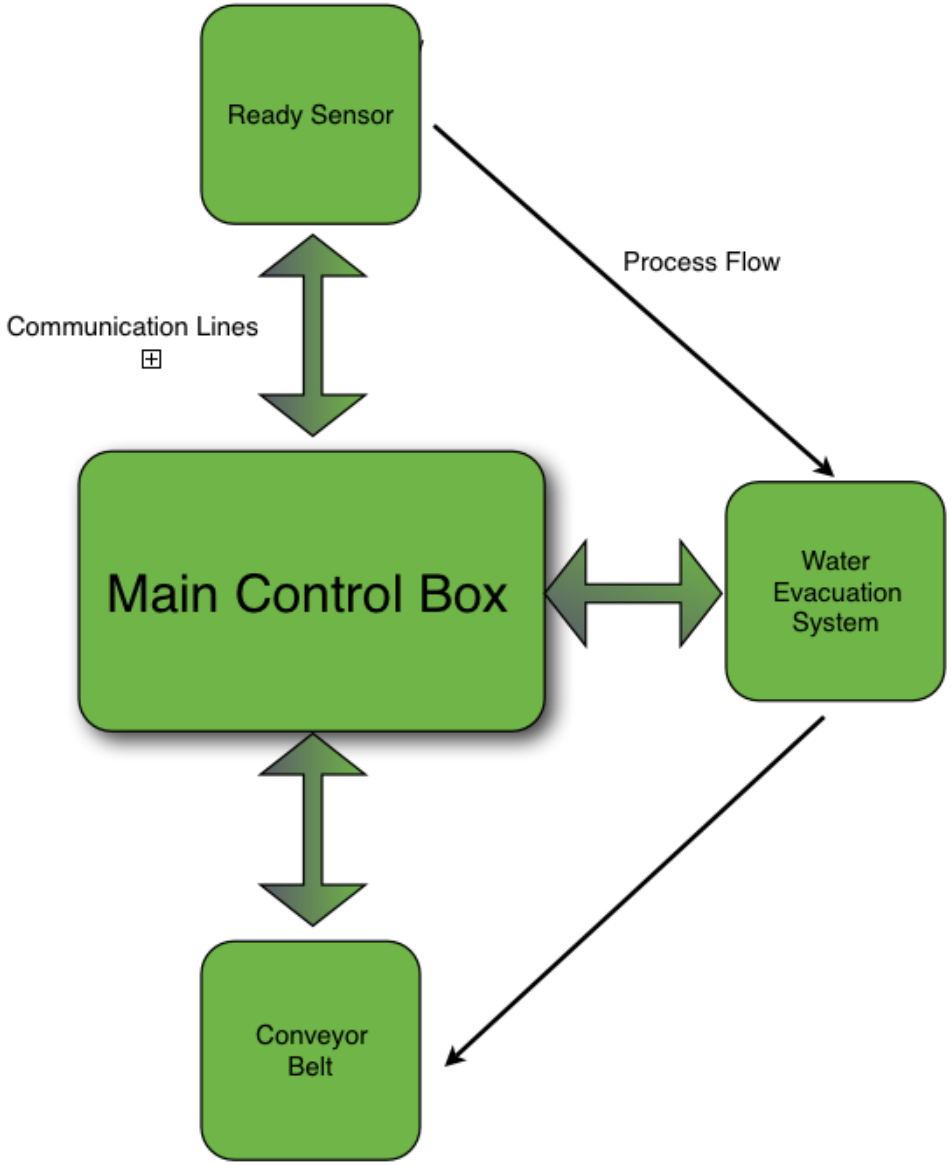
Concept 2: Between Conveyor and Cheesecake - Tank or Tank/Pump - Dispense 4 - Variable Time (2 sensors)

Concept 3: On Belt - Hard Pipe - Dispense One at a Time - Fixed Time (8 sensors)

Concept 4: On Oven Bed - Hard Pipe - Hose that can be flipped out of way (Dispense 8) - Fixed Time (1 sensor)

P11712 Proposed Design




Ready Sensor
Process Flow
Communication Lines
Main Control Box
Water Evacuation System
Conveyor Belt

P11712 Risk Assessment

ID	Risk Item	Effect	Cause	Likelihood	Severity	Importance	Action to Minimize Risk	Owner
System Design								
1	Control Box Malfunction	No comunications within the system	Programming Error	2	5	5	Schedule design period time	Noah/ Tony
2	Sensor Failure	Does not detect sheet pans	No power source	2	5	5	Gain knowledge about sensors	Joel/ Geoff
3	Sensor Failure	System cannot detect the sheet pans	Sensors aren't compatible with design	2	5	5		John/ Rod.
4	Lack of Structure Stability	Design doesn't stay in one place	Top heavy of tool or unstable foundation	1	3	3	Design stability tests	Noah/ Tony
5	User Error	System doesn't operate properly	Lack of trainning or tool undstanding	3	4	4	Schedule training perio with customer	Joel/ Geoff
6	Design and process aren't compatible	Design is not up to process' speed	Lack of communication with Customer	1	4	4	Constant communication with customer	John/ Rod.
7	Low rate of water output	Water output is not satisfactory	poor water pipes design	1	3	3	Design a system capable to adapt to facility's current structure	Noah/ Tony
8	High rate of water output	spills too much water	poor water pipes design	1	3	3	Design a system capable to adapt to facility's current structure	Joel/ Geoff
9	Design is not user friendly	Customer will not use it	Poor design	3	5	5	Design for workers	John/ Rod.
10	Multiple Design options	Slow down design construction	New design constraints	3	3	3	Robust design process and re-evaluation at each milestone	Noah/ Tony
11	Splashing during dosing of water	Wet and unsafe work environment	Leakage in the dispenser	1	3	3	Leak testing and hose component study	Joel/ Geoff
12			Unstable high water pressure	1	2	1	Pressure regulator	John/ Rod.
13			Over dispense water amount	1	2	2	Proper calibration of dispense time and amount	Noah/ Tony
14			Fast convyer belt acceleration	1	2	2	Calibration of cat eye and belt speed	Joel/ Geoff
15	Water dosed in cake pan	Failure of production line	Misalignment of dispenser	2	5	5	Proper prevention for moving cake pan out of way	John/ Rod.
16	Unwanted exaust from the prototype	In disagreement with food production code	Prototype internal parts exaust	1	3	3	Pick parts that does not output gas or other materials	Noah/ Tony
17	Prototype faile to extend for operation	Unable to dose water at correct location	Jam in the extension component	2	3	4	Test the extension unit after prototyping	Joel/ Geoff
18	Prototype not waterproof during cleaning	Unable to dose water for production	Inproper seal during production	2	3	3	Proper seal of all enclosures and mechanical components	John/ Rod.
19		Short circuit of compoents		2	5	5	If sealed property should reduce short circuit, proper electrical design	Noah/ Tony
20	Prototype consumes too much power	Energy is wasted during production	Internal electrical system design error	3	4	4	Estimate power consumption before testing and after testing	Joel/ Geoff
21	Leak occurs at the water input	Aging of pipes	Pipe subjected to heat or stress	2	3	4	Secure piping and tubing	John/ Rod.
22	Water dispensed at the wrong location	Water spill and production line hault	Inproper connection with detector	2	4	4	Sync with cat eye and test proof to only dispense when cat eye registers pans	Noah/ Tony
23	System unable to stop working	Water dispense non-stop	Internal programming error	2	3	3	Create switch for hardware shut off	Joel/ Geoff
24			Failure of system shut off	2	3	3	Create fail safe as redundency	John/ Rod.
25	Prototype faile to meet noise standards	Re-evaluation of noise source which causes delay	Malfunction parts	2	3	3	Find alternative parts with low noise or seal off the device	Noah/ Tony
26			High noise generating parts	2	4	4		Joel/ Geoff
27	Small repair space	Unable to reach broken parts	Parts designed too close together	1	3	3	Include minimum work space for comfortable repair	John/ Rod.
28	Special tools needed for repairs	Unable to repair on time due to limited tools	Protoype require special tools	1	2	3	Design for common tools	Noah/ Tony
29	Uncommon parts	Unable to repair due to missing parts	Hard to obtain / Rare parts	1	3	2	Backup parts is ordered in case of repair	Joel/ Geoff
30	Parts overheat	Failure of prototype operation	Inproper prototype ventalation	2	3	3	Proper vent is created for air circulation and cooling	John/ Rod.
31	Water pressure into the system is too high	Over dispense into sheet pan and changes recipe	Unstable city water pressure	3	4	3	Create a pressure valve regulator	Noah/ Tony
32	Water pressure into the system is too low	Under dispense into sheet pan and changes recip	Unstable city water pressure	3	4	3		Joel/ Geoff
33	Electrical components does not fit enclosure	Exposed parts vulnerable to damage	Poor design specs and measurements	3	3	4	Proper design in simulation before hardware	John/ Rod.
34	Water dispensed is not clean	Health hazard and production termination	Contaimnation of water from prototype	1	3	3	Create shutoff for such situation	Noah/ Tony
Current Cheesecake Process								
35	Design slows down baking process	Production line is less efficient	Low device performance	2	5	5	Redundent testing for timing	John/ Rod.
36		Production line is not functionable	Low device performance	2	5	5	Redundent testing for timing	Noah/ Tony
37	User Abuse (cleaning)	System breaks down	Lack of maintenance	2	2	2	Design must be robust/ Provide maintenance plan	Joel/ Geoff
38	Conveyor Malfunction	Production ceased	Facility power failure or Line malfunction	1	2	2	Advice Customer to develop a contingency plan	John/ Rod.

42	**Customer & Parts**								
43	39	Parts arrive late	Schedule is delayed	Unreliable vendor	3	4	4	Constant Communcation with vendor	Joel/ Geoff
44	40	Mismatch parts	Prototype can not be build	Manufacturing fault	3	4	4	Constant Communcation with vendor	John/ Rod.
45	41	-		Dimension check fault	3	4	4	Double check with teammembers on part specs	Noah/ Tony
46	42	Current budget reduced	Schedule is delayed	Project finncial importance change	2	4	2	Find alternative parts and not only 1 type of part only	Joel/ Geoff
47	43		Re-evaluation of current design		2	4	2	Have backup design for different hardwares	John/ Rod.
48	44		Aquire new parts within budget		2	4	2	Have options to choose from before hand	Noah/ Tony
49	45	User unsatisfied with operating interface	Unable to properly use in production	Design for interface too complex for user	2	4	4	Pre-approve the design before construction	Joel/ Geoff
50	46	Parts break during installation	Schedule is delayed	Error in installation	3	2	2	Order redundent parts for replacement	John/ Rod.
51	47		Unable to finish prototype for testing	Error in handeling of parts	3	4	4	Follow installiation procedure	Noah/ Tony
52	48	Conflict with worker about project	Prototype testing delay	Process automation	2	4	4	Locate mediator to improve communcation/ Seek feedback from managers	Joel/ Geoff
53	49	Project ran out of money	Unable to purchase additional parts	Fail to manage budget	2	5	5	Create a list of parts needed and their alternative with pricing	John/ Rod.
54	50	Prototype damaged during transporation	Schedule delay due to repairs	Unforseen accident	3	4	4	Use proper tools to transport such as carts trolleys	Noah/ Tony
55	51		Replacement parts cost	Inproper transportation tools / method	3	4	4		Joel/ Geoff
56	52	Unable to contact customer	Information related to design missed	Failure to communcate or change of contact	1	5	5	Stay in contact with multiple managing groups and guide	John/ Rod.
57	53	User unhappy with the deisgn	Unsatisfied result or product	Appearance of the design	3	5	5	Seek feedback from managers and engineers before initation	Noah/ Tony
58	54			Method of delivery	3	5	5		Joel/ Geoff
59	55	Reduction of team size	Increase in work load for remainning memebers	Team member leaves	1	3	5	Follow project plan	John/ Rod.
60	56		Delay in production and schedule		3	3	5		Noah/ Tony
61	**Out of Control Problems**								
62	57	Water pipes deteroration	Improper water flow	Excessive movement and temperature	2	3	3	Design a robust system	John/ Rod.
63	58	No Water	Water does not reach the system	leaks, repairs	2	3	3		Noah/ Tony
64	59	Low Water Pressure	Low flow rate	Fluctuation of city water pressure	1	3	3		Joel/ Geoff
65	60	High Water Pressure	High flow rate	Fluctuation of city water pressure	1	3	3		John/ Rod.
66	61	Power fluctuation	Unstable effect in system response	Fluctuation of power source	1	4	4	Design a stability box	Noah/ Tony
67	62	Internal parts damage due to shock	Prototype does not work	Inproper secure method of internal parts	5	4	4	Proper secure method such as belts or welding	Joel/ Geoff
68	**Team Members**								
69	63	Team runs out of time	Customer's requirements are not met	Lack of proper planning	3	4	4	Develop a Project Chart to keep the team on schedule	Noah/ Tony
70	64	Individual unable to finish team distributed wor	Delay in production and schedule	Not enough time	3	4	4	Spread the workload among team members	Joel/ Geoff
71	65			Members are not commited	3	5	5	Create a work list and due date to prevent unfinished work	John/ Rod.
72	66			Unable to complete due to complexity	3	3	3	Seek guide for advice on design details	Noah/ Tony
73	67	Teammates do not follow Team norms	Team unity suffers	Arguments within team members	3	4	4	Develop a proper way to approach team issues	Joel/ Geoff
74	68	Lack of communication among team	Deliverables suffered mistakes	Members do not understand requirements	3	3	3	Have a team leader that informs every member about current state	John/ Rod.
75	69	Lack of communication with customer	Delevirables do not meet requirements	Project follows wrong track	3	3	3	Share all documentations with customer/ constantly ask for feedback	Noah/ Tony
76	**Water Removal Process**								
77	70	Failure to remove water from sheet pan	backend process not improved but delayed	Prototype malfunction	3	3	3		John/ Rod.
78	71			Suction for the removal was too small	3	4	3		Noah/ Tony
79	72			Clog in the pipes from water waste	2	2	2		Joel/ Geoff