



Engineering Division



Engineering Services

Randolph Associates, Inc.
Engineering Division
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Engineering Client Services

Randolph Associates, Inc. is an international firm, providing solutions to the Food Processing Industry. We have established a solid reputation for success in improving operation and processes for some of the industry's leading companies.

Our engineering and maintenance experts have assisted clients across the industry to upgrade their facilities and realize improvements in plant process efficiency and production capacity. We assist clients in analyzing their existing plant systems and arriving at solutions that eliminate bottlenecks, reduce downtime, and meet or exceed energy, water, and chemical conservation goals. Our clients have come to depend on our abilities to perform specialized design analysis and formulate cost-effective solutions in a timely manner.

Services performed by our team of professional engineering and plant maintenance experts include:

General Engineering Services:

- Design and oversee **Capital Projects**, e.g., plant expansions.
- Configure, install, and de-bug **Process Control Systems**.
- Provide **Interim Management Services** and **Project Supervision**.
- Provide **Technical Training Services**.
- Develop **Preventative Maintenance Programs**.
- Provide **Mechanical Aptitude Testing Program** using the Scientific Management Timing Module.
- **Interface with State, Federal, and Local Agencies** and provide guidance in meeting compliance.
- Integrate **New and /or Modify Used Equipment Systems** to meet project objectives.
- Oversee **Equipment Rebuilds, Modifications, and Installations**.

HTST Systems Services:

- Provide **HTST System Audits and Assessments**.
- **In-Plant HTST Systems Training Course for Maintenance Personnel**.

CIP & Process Services:

- Provide **CIP and Process Systems Audits and Assessments**.
- Balance **process / CIP Flow Rates** for **Production and Sanitation Processes**.
- Evaluate **CIP Chemical, Energy, and Water Requirements**.
- Provide **Process / CIP Problem Solving** at application, system, and controls levels.
- Evaluate **Process Efficiencies** and **Calculate Improvements**.

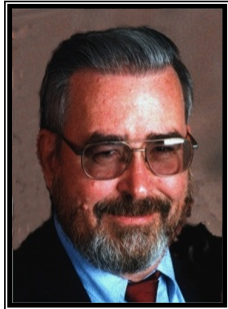
Helping Our Clients Realize Their Goals

Our engineering and maintenance experts have been pivotal in helping our clients overhaul their operations to adapt to new regulatory challenges, create innovative new product lines, and increase production capacity to meet larger market demands. Here are a few highlights over our 35 years of service to the Food and Dairy Industry:

- **Increased:**
 - Cultured products department of a major dairy producer by installing a new HTST, batching system, and packaging line and converting an older filling system for a new package size.
 - Ice cream and novelty plant from 3 million gallons per year to 8 million gallons per year.
 - Milk and juice cooler storage by converting a dry goods warehouse into a cultured products cooler (and moving the dry goods warehouse off site).
 - Efficiency at a leading ice cream facility, by evaluating and recommending operational changes.
- **Installed:**
 - A 2,000 lb bulk bag powder handling system to manufacture condensed milk in-house including installation of a bulk bag handling system, power reconstitution system, and additional storage tanks.
 - A complete cultured products operation for yogurt and sour cream production including the processing system, set tanks, filling and packaging equipment. Installed complete Bepex cottage cheese system from 3 vats through finished package handling.
 - A 5,000-gph milk and juice short-time system, doubling the plant's capacity with no increase in personnel.
- Established a preventive maintenance system for a dairy running 20 million gallons per year, resulting in a 30% production increase with a 14% reduction in labor.
- Developed a solid waste handling system for a large ice cream manufacturing facility.
- Redesigned an empty case handling system to include an automated empty case de-palletizing area with plastic pallet washing and stacking capabilities.
- Evaluated and recommended operational changes at a leading ice cream facility, resulting in carton handling improvements and increased efficiency.
- Installed, field tested, and debugged countless chemical feed systems, CIP systems, High-Pressure Cleaning Systems, and Plant Sanitation Systems while continuing technical support to operations staff.
- Developed CIP-able air blows to extend shelf-life and reduce plant shrinkage.

Our Team of Experts

Randolph Associates' engineering and maintenance team brings together over a century of combined service to the industry.



Joe White, Senior Associate, served as on-site engineer at Flav-O-Rich Dairy, in London, KY from 1974 – 1979. He was plant engineer and project manager at Publix Milk Plant from 1979 to 2004. He served as the on-site engineer during the last year of construction of the first Publix Dairy Processing Plant and was responsible for maintaining high quality standards during the construction and startup. Prior to joining RAI, Joe was a consulting engineer under the name J. White Enterprises, for All Star Dairy Association. Joe brings to the table over 35 years of experience in the food and dairy industries as a Project Manager and Preventive Maintenance consultant.

Areas of Expertise: Operation Reviews, Productivity and Efficiency Improvement, Preventative Maintenance Programs, Mechanical Aspects of HTST & CIP Systems, Interim Management, and Employee Training.

Dave Rocheville, Senior Associate, is in his fourth decade of troubleshooting food and dairy operations and organizing and training plant maintenance department personnel to function as highly effective teams. Over the course of his career, he has chartered plants from relay logic to PLCs and from there to fully integrated, distributive control systems. His leadership in conducting plant overhauls and establishing preventive maintenance systems has taken the financial sting out of taking that next step for his appreciative clients.



Areas of Expertise: Preventive Maintenance Programs, Operation Reviews, Production and Efficiency Management, Maintenance Employee Training, Project and Interim Maintenance, and Process Control.



Gerald Witherington, Associate – CIP/Process Specialist, received his degree in Engineering Technology from Memphis State University and has over 35 years of experience in the field as a troubleshooter and system design specialist. Gerald excels in designing, modifying, installing, and configuring control systems and controls for process and CIP operations. He has been involved in maintenance and upkeep of Plant Processing and Utility Equipment to include: Fillers, Casers, Stackers, Refrigeration, Pneumatics, and Steam. Among his accomplishments, Gerald initiated the Field Service Representative program for BASF Wyandotte.

Areas of Expertise: CIP Systems, Plant Utilities, Controls Troubleshooting, Mechanical Repairs, Equipment/System Modifications, and Preventative Maintenance Programs.

Methodology

When you are planning new processing, filling, or material handling equipment and you are seeking unbiased review and recommendations, we:

- *Understand your needs for plant process systems and / or equipment upgrades and improvements.*
- *Analyze capabilities of existing plant systems and equipment and make recommendations relevant to your plant goals.*
- *Assist in researching, selecting, negotiating, and installing selected upgrades.*

Because every facility has unrealized opportunities and hidden bottlenecks that hamper maximum production efficiency and restrict output, we:

- *Analyze and understand problems, opportunities, and bottlenecks.*
- *Evaluate corrective actions.*
- *Recommend cost-effective solutions.*
- *Assist you in implementing changes and upgrades.*

If your processing, filling, CIP and / or material handling systems have become inefficient and are wasting, time, manpower, energy, chemicals, water, or product, we:

- *Evaluate manufacturing processes and CIP systems for chemical, energy, and water conservation.*
- *Ensure CIP spray devices are correct for the tanks and equipment.*
- *Match supply and return flow rates for proper hydraulic balance.*
- *Evaluate options and return on investment.*
- *Recommend solutions.*
- *Implement improvements.*

When your maintenance or engineering team is short handed or stretched too thin, leaving them in need of temporary assistance, we are available.

The engineering division experts of Randolph Associates, Inc. look forward to working with you to return your systems to optimum efficiency.

SUPPLEMENTAL DOCUMENTS

Process Drawing Upgrades

Updating your plant drawings is more than an act of dutiful drudgery and expense. It is essential for maintaining a safe, efficient work environment.

Regulatory: Among other statutes, the PMO requires plants to maintain accurate process flow diagrams (PFDs) and process instrument drawings (PIDs), including CIP flows. Increasingly, plants are under the onus to comply with various HACCP-based compliance programs for acceptance by leading retailers and to compete in the global marketplace. ALL HACCP-based programs require regular review of plant drawings with documentation of associated upgrades as changes occur to the system.

Maintenance: Process drawings should reflect the actual equipment and instrumentation in use. Equipment, motors, and instruments should be identified by name, number, and function, e.g. FCV-1234. These identifiers should be matched to the computerized maintenance management system and the plant control systems displays, and plant control system electrical documentation. Agreement across the board assists in process control troubleshooting, expediting work orders, parts orders / retrievals, and changeovers as well as improving safety conditions.

Inclusions: Process Input / Output (IOs) for valves, pumps, etc.
 Matching of labeled components with control screen ID's
 Identifications in agreement with Electrical ID listings.

Sanitation: Once the plant drawings are up-to-date, CIP flows should be incorporated. The CIP additions should show routing and direction of CIP flow by individual CIP circuit. In plant color-coding of process / CIP piping flows by line contents (Raw, Pasteurize, CIP, as well as air, water, and steam) is highly desirable.

Process Optimization: Accurate drawings provide a starting point for System troubleshooting as well as process improvements, or modifications enabling process and CIP routing to be evaluated periodically and updated to eliminate bottlenecks and/ or enable process expansion. Periodic walk downs may also be used for planning maintenance activities.

Maintaining the accuracy of plant drawings is an all around benefit to plant operations. Upgrading should accomplish more than just updating labels or renaming fillers on a **Plant Drawing**.

G. Witherington
Rev. 7/26/2010

Understanding Costly & Common CIP System Problems

Most plant managers believe that everything is balanced for optimum efficiency when a CIP system is installed, and line and tank circuits are set up to be cleaned. However, considering the many components that go into a modern CIP system, numerous factors need to be evaluated on each circuit to insure that it operates as efficiently and cost effectively as possible. Over time, plants grow and changes are made to lines and equipment that can negatively affect the operational efficiency of CIP systems.

Some common examples of negative effects on CIP systems:

- Reduced cleaning effectiveness.
- Waste of expensive chemicals.
- Increased energy demand.
- Unnecessary water usage.
- Loss of production due to extended cleaning time.

These changes normally occur gradually, allowing them to go unnoticed, while significantly impacting the bottom line. Dividends returned on higher efficiency are not only financial, but environmentally sound as well. Water conservation saves money and conserves limited resources while reducing effluent volume. Smaller discharge volume results in lower disposal costs and less strain on the sewage infrastructure. Reduced energy consumption not only saves money, it produces a smaller carbon footprint.

In order to locate these negative changes or problems and regain lost efficiency, each circuit must be observed and evaluated independently. Plant personnel rarely have the necessary training, resources or experience to perform these evaluations.

Following is a partial list of common problems inherent to CIP systems resulting from plant operation and expansion.

CIP Tanks:

- Level controls drift out of calibration and wash tank does not re-fill before sending solution to drain **resulting in** wasted wash solution on each circuit.
- Chemical feed sensors develop a scale coating or drift out of calibration **resulting in** wash concentration being either too high or too low.
- Time feed systems become damaged **resulting in** chemical concentration below set point.
- Steam traps stick open on heat exchangers **resulting in** increased steam usage, wasted energy and extended circuit time.
- Steam traps fail to open totally **resulting in** delaying the attainment of temperature set point and extending circuit time.

CIP Supply Pumps:

- Pump seals leak causing cavitation, reducing flow rate **resulting in** less than turbulent flow through lines and insufficient flow to spray balls.
- Incorrect impeller replacement lowers capacity **resulting in** less than turbulent flow through lines and insufficient flow to spray balls.
- Flow meters drift out of calibration **resulting in** less than turbulent flow through lines and insufficient flow to spray balls.

Line Circuits:

- New sections of larger diameter pipe are added to existing line circuits **resulting in** less than turbulent flow in new section.
- Lines are added to existing circuits creating higher head loss **resulting in** diminished flow rate and loss of turbulent flow.
- Lines are added to existing circuits and sanitizer feed time is not extended **resulting in** sections of line not receiving adequate sanitizer.

Tank Circuits:

- Spray balls are installed incorrectly, or incorrect spray balls are installed **resulting in** shadowing and dead spots in tanks.
- Flow rate is set too high **resulting in** spray atomizing and loss of mechanical action.
- Flow rate is set too low **resulting in** umbrella spray not impacting walls of tank correctly.
- No filter on supply line **resulting in** plugged spray devices causing dead spots on tank walls, agitators or baffles.

Return Pumps:

- Incorrect impeller replacement lowers capacity **resulting in** return flow reduction, causing solution to build up in vessel and extending circuit time.
- Air eliminator gaskets wear allowing return pump to cavitate **resulting in** reduction in return flow, causing solution to build up in vessel and extending circuit time.
- Length is added to return lines causing higher head loss **resulting in** reduction in return flow, causing solution to build up in vessel and extending circuit time.
- New tanks with higher flow demands are added to existing return pump **resulting in** a miss-match between supply and return flow on existing tanks.

CIP system evaluation and optimization are specialties of Randolph Associates, Inc. We look forward to the opportunity to assist you in returning your systems to optimum efficiency.

PREVENTATIVE MAINTENANCE PROGRAMS

Randolph Associates, Inc. offers extensive Preventative Maintenance (PM) Development and Training Programs. An effective PM Program is essential to run a successful Maintenance Department. This program has been very successful in improving the operating efficiencies and reducing operational and labor costs for facilities.

The **Preventative Maintenance** Development and Training Program covers the following skills and competencies:

- Be able to understand the organization of a PM program for effective use of the MP2 software.
- Understand the capabilities of the MP2 software.
- Become proficient in the operation of the MP2 software.
- Understand how a PM program will improve parts ordering and inventory.
- Understand how an effective PM program will improve the operating efficiency of the plant.

BENEFITS OF A PM PROGRAM

- The ROI for a plant that uses a P.M. Program is 15% to 20% savings on the total of maintenance labor and repair parts for the year.
- Gives you a benchmark during the month to know where spending is taking place.
- Gives needed reports in minutes so you identify costly equipment and where your efforts need to be directed.
- Volume will increase with efficiencies and overall plant labor will decrease. Because you will run more efficiently, your utility costs will improve.
- A PM Program is a valuable tool for the plant engineer. Once used, the engineer will realize how much control of his resources he has and will be able to maximize his labor and systems.

Client Testimonial

“We appreciate the comments and help that Dave offers. The MP-2 Program will be invaluable as we go down the road to improving our quality and efficiency.”

Bill Keating, Operations Manager
Sinton Dairy Foods Co. L.L.C.

APPROACH TO PREVENTATIVE MAINTENANCE PROGRAMS

By: Dave Rocheville

Over the past few years, I have had to make systems work that were already installed in the plant (Ex. Mainsaver, Mainstar, some Maximo). Sometimes, I found the systems were not flexible enough to be able to repair, and it was cheaper to just start over with MP2. I have also installed MP-2 Access to MP-2 Professional 6.1. The plants I have done this work in cover a wide range of the food industry, beverages, water, dairy (all type -- fluid, cheese, ice cream, novelties) and salad dressings. Maintenance has been my profession since 1959--beginning with machine history requirements in the Navy on diesel submarines.

When I enter a plant for a Maintenance PM Program there are several important indicators I look for and work on.

- **Plant personality:** Plants are like people--they each have an individual personality even though they are a part of a certain industry. Once you figure this out, then you have a direction and goal that you can work within, and it becomes a road map.
- **Maintenance Department:** Does the department (personnel) have a manager or a leader? Departments can be managed, but over the years, I have learned people cannot be managed--they have to be lead. This person is the primary key to success and teamwork within the department. If he is a leader, he already has the respect of his crew.

I will then target the most obstinate employee in the department and get him in a positive direction towards the program. Once he is on board, the rest will follow. Should he not become positive, then we transfer him to another department or cut him loose. This sends a message to the rest of the crew about how important the program is and what priority the company puts on it.

- **Preventative Maintenance:** Next, I look to see the culture of the shop. Is there the semblance of a program present, be it index cards, software, a chart on the wall? Whatever is available helps, but a culture change has to happen in maintenance and production so that the department embraces and takes ownership of the program. They are the ones who make it work. An important part of this is that the department has to be made aware that top management requires that they use this important tool that was purchased for them because it profits the plant and it makes maintenance's job a little easier. The plant personnel are also made aware that everyone working in the plant is in a sense a maintenance personnel member, too.

They can see, hear, and feel what is wrong on the floor, and there are more of them than there are maintenance personnel, so their help is needed to help the maintenance department keep the plant running. This COOPERATION between maintenance and production is the ripple effect that emerges when the PM system starts bearing fruit. An operator who comes to work and can get the order out efficiently is a happy person. His attitude is positive, therefore, he treats equipment in a more positive way. **This is part of the ripple effect that can only be measured as part of up time, but this portion is difficult to assign dollars to.**

Quality also becomes part of the mix. I generally add the MASTER SANITATION PLAN to the program so that sanitation gets SANI PMs. This is a great tidbit for the regulatory personnel because of the record keeping. Here, again, we have the ripple effect of cooperation with QC, regulatory and maintenance.

- **Program Structure:** When setting up PM Systems, I believe it needs a defined structure just like a capital project. I set it up with a noun first then an adjective. To do this, one must understand plant maintenance equipment and how maintenance personnel think. This cannot be learned, but you have to experience it. This is a primary reason why PM programs set up by IT, MIS, software personnel typically are not successful. The other thing I find is companies give these programs to the local maintenance leader to implement. Normally, he does not have enough time in his day-to-day work schedule to dedicate the time it takes to do the set-up, and he has not been exposed to a program before. And they wonder why it fails.

My approach to Preventative Maintenance is very simple, but this helps maintenance to identify with a system because their world and the plant world are also very simple. **All of the above helps to bring maintenance from a cost center to a profit center and puts them on a path to sustainability.** They are the most important part of the success of a plant, and should have the tools in place that assure their success.

5/26/09

Mechanical Aptitude Testing Program

H. Randolph Inc. now offers Mechanical Aptitude Testing (“Black Box”) configured specifically to the needs of the Food and Dairy Industry:

Mechanical Aptitude Testing Program using the Scientific Management Timing Module enables you to:

- Gauge diagnostic skills/deficiencies of potential hires.
- Identify gaps in incumbent diagnostic skills.
- Develop operations and maintenance training activities to accelerate response time to upset conditions.
- Reduce downtime through early detection of incipient problems.
- Utilize mechanical failure scenarios with real relevance to the food industry, constructed by a forty-year veteran of the Food and Dairy Industry.
- Document improvement in operator/technician performance as a result of targeted training efforts.

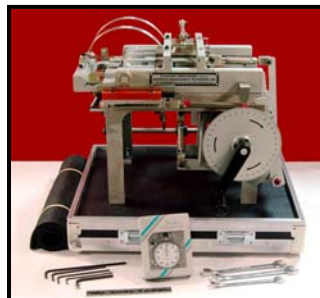
How it Works:

The standard timing module’s assembly consisting of shafts, cams, connecting rods, gears, racks, etc., forms an integrated machine that can be manipulated by a certified administrator to emulate common failures and maladjustments.

The time taken by the candidate or incumbent technician to diagnose the problem and take corrective action is indicative of their relative ability to diagnose potentially relevant mechanical problems and make necessary adjustments.

Operating scenarios constructed by an industry expert familiar with food manufacturing equipment provide relevant feedback by simulating mechanical conditions most apt to disrupt food processing operations and undermine productivity.

Our certified Mechanical Aptitude Testing (“Black Box”) administrator, Joe White, is available for system demonstrations, technician testing, and related operator and maintenance training services. Call or e-mail now to find out what a Mechanical Aptitude Testing Program can do to maximize the skill level of your workforce.

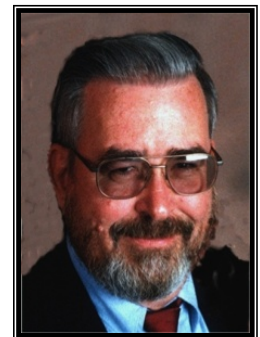


*“We have employed **Randolph Associates** since 1987 to provide Sanitation and GMP consultation. These services included the assessment of our Sanitation and GMP Programs, the development of improved procedures for these programs and the training of our employees to provide compliance to these procedures. Their technical expertise and ‘call it as they see it’ approach has challenged both our plant and business management teams to improve their overall operational practices in a financially responsible manner.”*

-Bill Newman

*“**Randolph Associates** is always our first choice for training or consulting assistance. They have provided our associates with professional, hands on training for good manufacturing practices, and sanitation training. Instruction is designed to meet not only for compliance, but the needs of our facility.”*

-John Cox



Joe White
joe.white@raiconsult.com

CIP System Assessment Check Sheet

Plant Name: Dairy Processing Plant	Date: 3/9/10
Location: Any Where, USA	
CIP System Designation: CIP	

Yes = Y, No = N, Not Applicable = N/A, Note = (#)

System Type:	
Single / Reuse	S

P&ID Drawings:	
Are there P&ID drawings?	N
Are they accurate?	N

Pinning Chart:	
Are pinning charts available?	N
Do they match program?	N

Tanks:	
Fresh Water?	Y
Alkali?	N/A
Acid?	N/A
Rinse Recovery?	Y
Motive?	N/A

Fresh Water Tank:	
Dimensions L, W, H / Volume	48" X 23" x 32" 153 gal
Level Control: Style:	Probe, Warwick
Overflow: Side / Center	Side 140 gal to overflow
Level: Low / Medium / High	4", 14", 24"
Volume: Low / Medium / High	19 gal, 67 gal, 114 gal
Vortex Breaker?	N
Does water supply keep up?	Y
Is there rust in top of tank?	N
Adequate air break on inlet?	Y

Supply Pump:	
MFG:	Fristam
Model:	FPX3532
Inlet:	2.5"
Outlet:	2"
Impeller Size:	175 mm
Horsepower:	15
RPM:	3450
Max Capacity: Flow / Pressure:	
Max Actual: Flow / Pressure:	
VFD?	Y
Does pump cavitate?	Y
Leaks?	N
Unusually noisy?	N

Flow Control:	
VFD / Throttling Valve	VFD

Supply Pressure Sensor:	
MFG:	Anderson
Style:	T/C
Size:	2"
Working correctly?	?

Agitator:	
Horizontal / Vertical?	Horizontal
Removed during CIP?	N
Run during CIP?	Y

Inlet Valve:		
Size?	3" Y body	
Pulsed during CIP?	Y	
On / Off time:	30 sec	5 sec

Outlet Valve:		
Size?	3" Tangential	
Pulsed during CIP?	Y	
On / Off time:	120 sec	5 sec

Baffle:	
Is there a baffle in the tank?	N
Is there shadowing in tank?	N

CIP Door:	
CIP Door ?	Y
Type CIP Door:	Rubber Insert
Is there excessive sol. lost?	N

Valve Sequence:	
Do all valves shift during circuit?	Y
Do all valves close against flow?	N
If not does flow stop when shifting?	Y
Does each leg of the circuit have all phases of the cycle?	Y
Does each leg of the circuit have the proper flow rate?	Y
Does each leg of the circuit reach the proper temperature?	Y
Does each leg of the circuit receive sanitizer?	Y

Establish Recirculation:	
Time based / meter based?	Time
Time / Gallons?	5 min

Caustic Addition:	
Time / Conductivity?	Time
Seconds / Milliseimens?	90 sec
Set point / Actual	89 sec

Conductivity Check:		
Milliseimens: Set point / Actual	25 ms	33 ms
Titration: Set point / Actual	12 drops	17 drops

Delay to Temp	
Set Point?	145°F
Time to reach set point?	12 min

Observations and Recommendations
1) There is rust building up in top of the Post Rinse Recovery Tank. This should be cleaned with acid so it does not get in water.
2) Fresh water tank outlet valve leaking at stem seal.
3) When the system goes into the Chemical Feed / System Fill step, the acid comes into the fresh water tank and starts to build a head of foam. As the level in the tank falls, the foam stays in contact with the intermediate level probe, keeping the Water make up valve from coming on. This allows the tank to go to a low level causing the supply pump to cavitate.
4) After the 2 pre rinse steps, the system stops circulating and refills the fresh water tank. It then adds caustic to this tank for 15 min. After 7 min. the tank is full and the remaining 8 min. of caustic is overflowed to the floor.
5) The check for conductivity step is directly after the start of recirculation. Since the chemical is all in the first 40 gallons to go into the tank, it comes back to the conductivity sensor in a high concentration causing the system to advance based on this high concentration. There were occasions where the system advanced into recirculate with low caustic.
6) The Supply meter has a reducer directly on the discharge side instead of the required 5 pipe diameters of straight pipe. This will have a negative effect on the accuracy of this meter.
7) The supply meter was installed with vortex shedder mounted horizontally instead of vertically. This can affect accuracy accuracy of meter.
8) The return meter shows flow to be 30 gpm more than supply meter while on line circuit. One is obviously incorrect.
9) The supply pressure sensor is showing ### on the display which indicates the sensor is not working.
10) The trend chart does not record the supply pressure. Having this added will make the trend charts more useful.
11) The average delay to temp on tanks is 13 min. and lines is 18 min. If hot water were piped to the CIP system this time could be reduced by an average of 8 min. on tanks and 10 min. on line circuits.
12) P&ID drawings are not available for the line circuits. It is difficult to follow line circuits without documentation.
13) Pinning Charts are not available for tank or line circuits. Without documentation, it is hard to determine what is scheduled.
14) The inlet valve on Silo Tank is a normally open valve. The valve is open for 10 sec. and closed for 30 sec. There is no flow or turbulence when the valve is closed. The valve should be pulsed in multiple short cycles in order to get more turbulence behind the valve seat.
15) The CIP design is for the inlet valve to have a flow of 10 gpm. There is a 1/2" hose coming off the spray ball supply line feeding this valve. Without a restrictor in the spray ball line, there will not be enough flow into the inlet valve.
16) This tank is designed for a flow of 115 gpm to the spray dish, 10 gpm through inlet jumper and 2.5 gpm to agitator. This equals 127 gpm. The existing flow rate of 90 gpm is well below this requirement. Need to increase supply flow rate.
17) Tank is being washed without an air eliminator installed on the return pump. Return pump is cavitating causing pooling.
18) The temperature on the chart recorder is swinging up and down continually while the temperature on the graph is holding steady. This indicates that there is a problem in the chart recorder EME.
19) It is taking up to 30 min. to reach the preset return temperature on this system. The temperature differential across the heat exchanger is 17°F and should be 40 to 50°F.
20) The intermediate rinse between caustic and acid steps is using cold water. This cools tank back down prior to the acid wash cycle. The intermediate rinse should use hot water to keep from cooling the tanks back down, wasting time.
21) The CIP return pump stops running when the outlet valve pulses. It is set to accelerate slowly which causes the tank to pool. There is no reason for this pump to stop running while pulsing outlet valve.

HTST Specification and Assessment Check Sheet

Plant Name: Dairy Processing Plant	Date: 3/10/10
Location: Any Town USA	
HTST Designation: HTST #1	
Product: Any Product	

Yes = Y, No = N, Good = G, Bad = B Not Applicable = N/A, Note = (#)

Balance Tank			
Tank volume:	70 gal	Will lid open if balance tank overflows?	Y
Are all inlet lines 2 1/2 pipe diameters above overflow?	Y		

Plate Unit			
Plate unit manufacturer:	AGC	Plate stack Min. / Max.	48 3/8" 49 1/4"
Maximum working pressure:	200 psi	Actual dimension of plate stack:	49"
Serial #:	*****		
Model:	R56	Number of plates:	176 176
Mfg. date:		Product flow rate High:	80 gpm 75 gpm
Latest revision date:	4/21/04 AGC	Product flow rate Low:	40 gpm 37 gpm
Frame size:	3	Is CIP flow rate 1.25 times Product flow:	N
Plate style:	PRO 5	Are dead legs more than 1 pipe diameter from full product flow?	Y
Total liquid volume:	103	Are utility thermometers and gauges functional and accurate?	N
Take Up Style: Man/ Auto:	Man		

Regenerator Section				
	Spec.	Actual		
Dimension of plate stack:	28"	28"	Past. product temperature in Low:	180°F 179°F
Number of plates:	113	113	Past. product temp. out Low:	54°F 56°F
Raw product temperature in High:	38°F	42.3°F	Past. product pressure drop Low:	18 psi
Raw product temperature out High:	170°F	166°F	Do all deflector plates have 3/16" drain holes in bottom of blocked port?	Y
Raw product pressure drop High:	15 psi		Is raw inlet line at bottom of press?	Y
Raw product temperature in Low:	45°F	44°F	Is bottom of regenerator section above overflow of balance tank?	Y
Raw product temperature out Low:	164°F	160	Does raw inlet line drain back to balance tank?	Y
Raw product pressure drop Low:	18 psi			
Past. product temperature in High:	178°F	179°F		
Past. product temperature out High:	53°F	57°F		
Past. product pressure drop High:	15 psi			

Booster Pump			
MFG:	Fristam	Discharge size:	2"
Model:	FPX 1741	Booster pump can operate only:	
Horsepower:	10	If forward flow has been attained?	y
RPM:	3500	If pasteurized pressure is 1 psi. above raw (4 psi. is recommended)?	4 psi
Hertz if pump is variable freq. drive:	55 hz	If 10 min. CIP timer is satisfied?	y
Impeller size:	145 mm		
Inlet size:	2.5"		

Regen By Pass Valve			
MFG:	Tri Clover	Is valve close coupled to eliminate possible dead leg?	Y
Model:	371	Is 1" air gap between valve/actuator?	Y
Size:	3"	Does valve operate smoothly?	Y
Condition of stem seals:	G		
Condition of valve plug:	G		

Separator			
MFG:	Westfallia		
Model:	SAMM12006	Product Inlet pressure:	3 psi 6 psi
Serial #	1648081	Product skim back pressure:	60 psi 60 psi
Horsepower:	100 hp	Butter fat:	
Drive style:	Clutch	Cream back pressure:	60 psi 80 psi
Time needed to achieve full RPM:	7 min	Cream butter fat:	45%
RPM:			
CIP inlet pressure:	15 psi	Oil change frequency:	90 day
CIP skim back pressure:	50 psi (#5)	Overhaul frequency:	365 day
Product desludge timing:	30 min	Vibration, will nickel stand on edge?	Y
CIP desludge timing:	48 min		

Observations and Recommendations
1) Dart sensor is located on an adaptor which moves the sensor 5" away from tee, creating a dead leg.
2) There is no pressure gauge on the hot water return line and the water make up relief valve drains constantly.
3) There are no pressure gauges or thermometers on Glycol section, no way to monitor glycol temperature or pressure.
4) The Homo suction pressure gauge is in-operable. The discharge pressure gauge is missing. (Both Pressure gauges replaced.)
5) The Homo suction valves have recently been replaced, but the valve seats are scored so the new valves are showing signs of wear. The suction and discharge seats should both be replaced before the new valves are destroyed. This will help eliminate the vibration on the inlet and outlet lines around the homogenizer.
6) The pulsation dampeners on the inlet and outlet of the homogenizer are simple stand pipes. If the stand pipe is full of air when the system starts, there will be no down stream vibration. As the air in the stand pipe gets absorbed by the product, the pipe will fill with product and the system will vibrate violently. These stand pipes should be replaced with a bladder design.
7) This homogenizer was designed to run at 1,200 psi but is now running at 1,500 psi. A test run should be made on all products running at 1,200 psi to determine if the homogenization efficiency is good at the lower pressure, if so the standard pressure should be reduced back to the original. It is a waste of energy and added wear and tear on the equipment to run at the additional 300 psi.
8) There is no pressure relief valve between the Homogenizer and the heater section of the press. If a blockage occurs down stream this will cause the heater section of the press to blow out between the plates. A pressure relief valve should be installed.
9) The pasteurized hold back valve is an old style Tri Clover 361 series with a closed yoke between the actuator and valve body. No longer approved for product contact. This valve should be replaced.
10) There is a concentric 3" X 2.5" reducer at the inlet to the FDV. The PMO requires that reducers at the outlet of the holding tube be eccentric with the flat section on top to ensure that no air can be trapped in the line affecting the holding time.
11) The drain lines from the FDV and LDV are not pitched 1/4 inch per foot back to the balance tank. This should be corrected.
12) The separator inlet pressure goes into a negative pressure at times. This can cause air entrapment and should be avoided. The inlet pressure should be established at the proper flow rate and then the skim back pressure should be increased until overflow is established. Once overflow is established then the skim back pressure should be reduced by 3 psi.
13) CIP Skim Back Pressure is below product pressure. CIP pressure should be 5 psi higher than product back pressure.
14) Vacuum breaker is being soaked in HTST balance tank during CIP. Balance tanks do not provide proper turbulence to be used as COP tanks.
15) The vacuum breakers are not being taken apart on a daily basis and cleaned. This creates a possibility for post pasteurization contamination. These units should be hand cleaned daily or replaced with CIP style vacuum breakers.
16) Average CIP flow rate is 95 gpm (3' per second) . Recommended CIP flow rate for 4"Holding Tubing is 162 gpm (5' per second). This HTST unit is not capable of achieving the recommended CIP flow rate for the 4" holding tube.
17) When system resumed in pre-rinse step Separator shot and chute was dirty. System is not getting clean enough before system enters establish recirculation.
18) Homo inlet pressure gauge has a cracked diaphragm and needs to be replaced.
19) The cream cooler is only receiving a CIP flow rate of 6 gpm. Average cream flow on skim is approximately 8 gpm. This pump should be run at maximum speed during CIP to achieve maximum flow through cream cooler.
20) The HTST CIP program does not contain a delay to temperature step. The program timer starts immediately without regard to the temperature. System should be delayed until CIP temperature is reached.
21) Hot water temperature indicator shows an 11°F differential between hot water and Product side of clean press. Hot water temperature sensor should be calibrated.



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