MISSION REPORT

ENTERPRISE COMPETITIVENESS

"DIRECT SUPPORT TO AGRIBUSINESS ENTERPRISES IN JAMAICA"

Mission Report, Kingston, 1 – 11 December 2009

PROJECT INT/75/24D

International Trade Centre

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Profile of enterprise 1. Southern Fruits & Food Processors

Address:	Bull Savannah, St. Elizabeth
Telephone:	+1 876 965 8060
Owners:	Mr. Kenrick Vassell, Mr. Derrick Rochester, Mr.Trevor Bernard, Mr. Winston Sinclair (25% each)
Managing director:	Mr. Derrick Rochester
General Manager:	Mrs. Donna Bromfield

Southern Fruits & Food Processors is a medium size enterprise founded in 1976. Current management is in charge of operations since 1989. The company uses less than 10% of its installed capacity and operates at a loss. Part A of this chapter highlights the technological findings and recommendations; part B tackle the maintenance aspects; part C describes the strategic choices and the consequences on cost of goods and profitability; part D summarizes follow-up tasks for the next mission.

PART A – TECHNOLOGICAL REPORT

During the December mission the only production that could be visited was mango juice production. Mango 'juice' is actually more a nectar than a juice and is filled in 400 ml cans. The used equipment is very old and hygienic conditions are poor. No improvements to the equipment have been made since the previous visit in June 2009. The organization on the work floor was poor causing unnecessary delays. All recommendations made for the mango juice can also be applied to the other canned products.

1. Mango juice.

Process step: Juice preparation.

Shortcoming: The pH of the juice is not correctly measured. The pH meter is not calibrated correctly and showed a deviation of 0.3 pH. The reading is therefore unreliable.

Consequence: The pH cannot be monitored correctly and the pasteurization process cannot be optimized accordingly.

Suggestion for improvement:

1. An extensive follow-up training is needed. Local staff needs training in juice preparation, microbiology and basic chemistry.

2. Calibrate the pH meter on a daily basis and establish pH specifications for each finished product. Pasteurization and/or sterilization conditions will be established accordingly.

Outcome:

1. Full understanding of the process. Ability to optimize the process and as a result, energy savings of circa 80% (see process step: cooking).

2. The pH will be measured correctly and when needed, the pH can be corrected by adding citric acid. Pasteurization conditions can be optimized and eventually the retorting process will no longer be needed because of the controlled acidity level.

Investment cost: None.

Follow-up required: No investment is needed. However SFP will need technical assistance for training and further technical assistance.

Process step: Filtration (refining) of the blended nectar.

Shortcoming: The blended nectar is filtered by use of a pulper/finisher with a sieve of 0.4 mm after it is heated to 212º F in a blending tank. Surprisingly, during processing of the mangos, the mango nectar is filtered through a finisher with a sieve of 0.6 mm.

Consequence:

- Recontamination of the nectar.
- Drop in temperature from 212ºF in blending tank to 175 ºF in filled cans.
- Unnecessary increase of production cost.

Suggestion for improvement: Several possible solutions are available:

1. It is likely that the refining with 0.4 mm is not needed. For mango juice/nectar, refining with 0.6 (or even 0.8) is fine enough. This should be checked first.
2. If refining with 0.4 is needed to eliminate black spots in the puree, this process step should be performed during the processing of the mangos. Under the principle: do it right the first time.
3. If, for whatever reason, the blended nectar must be refined, it should be done before the final heating in the cooker. This will guarantee the correct filling temperature and avoid the retort process (see above: Juice preparation)
Outcome:
1. Reduced time per production cycle, hence greater productivity. Improved transformation cost.
2. Reduction in energy consumption.

Process step: Filling in cans.
Shortcoming: The filling principle is the following: A horizontal tube with a succession of holes drilled approximately every 4'' allow the mango nectar to flow by gravity. The cans pass underneath and are filled. Even though the cans are adjacent one to each other it is unavoidable that juice is lost at the junction between each can.
Consequences: Uncontrolled amount of juice losses. The loss is estimated at 5% (but the real figure can be higher).
Suggestion for improvement:
1. Measure the amount of juice lost during filling in order to calculate the economical potential for improvement and the ROI time should an investment be decided.
2. Fill manually, or better, invest in a linear volumetric filler.
Outcome: Juice losses during filling will be reduced to less than 1%.
Investment cost: USD 500, for manual filling; USD 10.000 for a (new) linear volumetric filler.

Process step: Retort regime.
Shortcoming: The mango nectar is filled at 175°F after being cooked at almost boiling point. It is clear that the pasteurization of the juice is more than sufficient. However the filling takes place under poor hygienic conditions and post contamination is inevitable. In addition to that the container is not aseptic.
Consequences: Due to the filling temperature of 175°C. The risk of a microbiological spoilage of the packed nectar is high, (contamination by heat resistant molds),
Suggestion for improvement: A controlled filling temp of 190°F, in a pre-heated can, will eliminate the risk of spoilage after filling.
Outcome: The retort process can be eliminated for mango juice. This will improve organo-leptic qualities of the product and reduce operational costs.
Investment cost: None.
Follow-up required: Training and technical assistance

2. Mango pulp

Process step: Blanching.
Shortcoming: Blanching takes place in an open air steam vessel. There is no temperature control. The steam valve is permanently open even when the required temperature is reached.
Consequences: Too high energy consumption.
Suggestion for improvement: Temperature probe with solenoid valve on the steam inlet.
Outcome: Steam consumption will be significantly reduced.
Investment cost: USD 1.000 Pay back is likely to be in the range of a few weeks!!

Process step: Peeling and de-stoning
Shortcoming: Quantity of waste is not measured.
Consequences: There is no exact yield calculation.
Suggestion for improvement: Measure on a regular basis (once a week) the quantity of waste. Measure the yield and use that figure as a reference for corrective actions and cost calculation.
Outcome: Process better controlled; improved yield.
Investment cost: None

Process step: De-stoner/blancher.
Shortcoming: Temperature is ca. 40°C.
Consequences: Yield will be low and enzymatic activity is not inhibited.
Suggestion for improvement: Modify the blancher to increase the holding time depending on the temperature of the pulp after de-stoning so that a temperature of at least 65°C is achieved.
Outcome: Better yield; better texture (viscosity) of the finished pulp after refining.
Investment cost: USD 500 for a variable gearbox.

Process step: Cooker-boiling tank.
Shortcoming: No temperature control.
Consequences: Uncontrolled process.
Suggestion for improvement: This is probably the most important process step apart from the retort. A simple temperature probe will solve this shortcoming.
Outcome: Better quality, better taste, less energy consumption.
Investment cost: USD 100.

Process step: Refiner.
Shortcoming: For pulp production a sieve of 1.2 mm is used: This is too big. For juice/nectar a sieve of 0.4 mm is used: This is too fine.
Consequences: For mango pulp the puree will not be sufficiently refined and is likely to contain too many 'black spots'. For juice the nectar will be extremely smooth but the sieves are expensive and will be easily broken.
Suggestion for improvement: Use only a sieve of 0.8 mm for both juice and pulp.
Outcome: Quality of pulp will be better, yield of juice production will be slightly higher and fewer sieves will be consumed.
Investment cost: None, the sieves are available.

Process step: Cooker
Shortcoming: The two cooking tanks have a direct exhaust chimney which goes straight through the roof. There is no reason for this exhaust chimney (the present owner found these tanks in the factory when acquiring the plant and kept them in the original state) as a consequence of this most volatile components (including aromas) evaporate freely during the heating process.
Consequences: Almost all volatile aroma components will be lost during the cooking process
Suggestion for improvement: Use the excess steel plates (which are available in the plant) to construct a cover for the tanks and close the tanks during the cooking process.
Outcome: Better hygiene, better quality of the end product, less energy consumption.
Investment cost: Circa 10 man hours of labor for each tank.

Process step: Storage of mango pulp.
Shortcoming: At present, aseptic storage is not technically possible. Therefore it is not possible to guarantee a long shelf-life for the finished pulp produced.
Consequences: Due to the short shelf-life, SFP has neither the possibility to distribute nor to export its mango pulp. The quantity produced is mainly for self-use. This is a big limitation considering the fact that up to 1.000 Ton of organic mango pulp can be produced every season, with very attractive margins.
Suggestion for improvement: Install an aseptic packaging line to pack aseptically in 200 liters (55 gallons) steel drums.
Outcome: undoubtedly the biggest possible step forward for SFP. Sales volumes and revenues will increase significantly. Estimated increase: USD 1 million with a gross margin of 50% (!) Good quality product with a long shelf-life and no need for refrigeration.

Investment cost: Following figures are indicative only. Second hand equipment can be available at much lower prices.
1. Tubular heat exchanger: USD 200.000
2. Aseptic filler: USD 100.000.
Follow-up required: Extensive training and technical assistance will be required, (see Part C).

3. All products

Process step: Retort regime.

Shortcoming: The pasteurization/sterilization conditions for the different products are neither monitored nor adapted to the product.

1. Mango juice (which as a low pH) must be filled at 88°C (190°F) and should not need any additional pasteurization.

2. Carrot juice and ketchup (which have a higher pH) are filled at 88°C but the pH is not measured, nor is the temperature inside the can measured during the pasteurization process.

Consequences: For mango juice (retort regime: 15 min at 245°F) it is clear that over pasteurization takes place. For carrot juice (Retort regime: 55 min at 245°F) and ketchup it is not known whether the sterilization is effective or not. According to Southern fruit they 'never' had any microbiological spoilage in the past. It is very likely that over pasteurization is happening.

Suggestion for improvement:

1. Mango juice: monitor the pH and cancel the post filling pasteurization. The pH should not exceed 3.7 and the filling temperature should not be lower than 190°F (88°C).

2. Carrot and ketchup: control and standardize the pH and monitor the temperature inside the cans during the retort process in order to optimize the time/temperature diagram. As a general principle, the pH should be lower than 4.4 however in practice it is better to correct the pH with citric acid whenever the pH is higher than 4.0. **Correct calibration of the pH meter is required!!** During a follow up visit it would be possible to do one or two retort cycles with a sensor inside a can to have a first idea on the effectiveness of the actual process.

Outcome: Reduction in energy consumption and quality improvement of finished products.

Investment cost: None.

Packaging: Tin cans

Shortcoming: Packaging costs are extremely high and constitute 50% of production cost. (24 cans cost 700 Jam$ or 8.25 US$). This high can price is suffered by all food processors in Jamaica. Only one supplier (Crown Cork–Metal box) is active on the Jamaican market and enjoys a full monopoly. This supply problem must be addressed. It creates a big handicap for can contained Jamaican exports.

Suggestion for improvement:

1. The situation might probably be challenged if a critical mass of processors could join forces (group purchasing) to order a minimum quantity of cans abroad (20 feet container?)

2. Another alternative would be to explore the possibility of using plastic containers with aluminum pop up lids (but production of plastic containers must be local). This kind of packaging can be hand or machine sealed and the finished product can be sterilized.

Outcome: Less costly packaging.

Investment cost: None for group purchasing, to be determined for substituting plastic containers to existing cans (trials are mandatory).

4. Pepper mash.

Process step: Preservation by brining.

Shortcoming: When opening the bags containing salt, some plastic fibers of the bag are cut free.

Consequences: Plastic fibers are mixed with the salt and therefore also in the product.

Suggestion for improvement: Open the salt bags in a different manner.

Outcome: Product will be free of plastic fibers.

Investment cost: none

Follow-up required: none

Process step: Preservation by brining.

Shortcoming: The salt is added randomly and the quantity of salt is not measured accurately.

Consequences: The percentage of salt is not precisely measured (13% as required and as per specification).

Suggestion for improvement: Ideally the salt should be mixed continuously in each production batch. This requires an investment in the form of a dry mixer. Alternatively the quantity of salt could also be measured accurately using always the same -right volume- container.

Outcome: Preservation will be in accordance with specification. No spoilage will occur.

Investment cost:
1. Dry mixer: USD 10.000.
2. Accurate container: none
Follow-up required: none

PART B – MAINTENANCE

Shortcoming: The workshop dedicated to maintenance of equipment needs to be upgraded and reorganized. Maintenance is limited to simple operations such as preventive checks, routine lubrication, replacement of belts, etc. Some operations are difficult to carry out for lack of appropriate tools. For example the dismantling of stainless steel pipes after a process step has been completed takes longer than it should because the wrench used to unbolt the pipes is not of the right type. (It would also make sense to acquire a second set of stainless steel pipes so that one set is operating while the second is being cleaned). There is no preventive maintenance schedule, no spare parts in inventory. Maintenance is difficult to perform: No lifting equipment, no mobile bench no vice...
Consequence: The equipment is poorly maintained, the availability ratio is undoubtedly low, the yearly cost of maintenance for the main equipment is not known. An equipment breakdown can be fixed rapidly if the spare part is available in Jamaica, otherwise the spare part must be imported and the down time can greatly vary: The situation is not managed but endured.
Suggestion for improvement: A proper workshop dedicated to maintenance operations must be created. The workshop must be closed, windows protected and door locked to prevent foreign intrusion. A complete set of tools, wrenches, thermal sensor, vibration sensor, etc. allowing monitoring and first level mechanical and electrical interventions must be acquired.
Mr. Lawrence Paul, maintenance manager, should list all main equipment (i.e. equipments which when out of order prevent the production to progress) that is to say, boiler, cooker, seamer, etc. And record the following information:
Type, model, serial n°, date & country of manufacturing, name of the manufacturer.
Once corresponding data are gathered, the manufacturer (or closest authorized retail agent) will be contacted in order to obtain the list of recommended spare parts constituting the "first aid kit" that is to say the list of all wearable parts with the recommended replacement frequency calculated in work/hours. The recommendation of the manufacturer will be benchmarked against the maintenance experience accumulated by the maintenance team. The key spare parts (spare parts which are not freely available, which have a short life span, and which unavailability could cause a severe loss of revenue due to a production stoppage), will have to be acquired. If the cost of brand new spare parts is too high, the possibility of acquiring standard replacement part or second hand parts will be investigated.
It has to be noticed that the maintenance team is professional and well trained, which is not so common in the Jamaican small and medium business environment.
Recommendation: It is recommended that **Mr**. **Alwyn Lynch** from Ebony Park who is a skilled electromechanical engineer (and who trained several members of the maintenance team) is contracted to assist in the field of:

1. Implementing a workshop with needed tools
2. Organizing the workshop (mainly 5S)
3. Assisting in establishing the list of the main spare parts to keep in inventory
4. Drafting a preventive maintenance schedule

PART C – COST OF GOODS

The company uses less than 10% of its installed capacity and operates at a loss. In order to change this situation, two strategic directions are explored:

1. Increase the range of consumer products (B2C);
2. Produce purees and concentrates of tomato, mango and pepper in aseptic packing (B2B)

1. Consumer Products (B2C)

To diversify its portfolio of consumer products (B2C) management has embarked upon the production of a range of jerk products (15 SKU's), bringing the total to 25 SKU's.
Ackee and Carrot Juice, canned in A2 tins (19 oz/ 540 ml), are the most important products and account for over 75% of sales in the past three years. Tomato ketchup contained in HDPE jars, and mango nectar canned in A2 tins, account for another 22%. The other 11 products account for the remaining 2% of sales. The client portfolio is equally skewed: 2 clients out of a total of 56 buy 45% of produce. The classic 80-20 rule also applies as 11 out of 56 clients buys 81% of sales in the period 2007 to 2009.

CB2 SOUTHERN FRUIT & FOOD Ltd, Bull Savanah, Jamaica										
	ACTUAL SALES	2007		2008		2009		Average		
	Product	Tons	USD	Tons	USD	Tons	USD	Tons	USD	USD %
1	ACKEE	18	122,303	9	112,691	38	115,875	**22**	**116,956**	*38.3%*
2	CARROT JUICE	57	67,242	93	162,495	78	120,319	**82**	**116,685**	*38.2%*
3	TOMATO KETCHUP	92	60,356	128	39,130	39	39,624	**58**	**46,370**	*15.2%*
4	MANGO NECTAR	12	13,440	11	15,376	22	31,185	**15**	**20,000**	*6.5%*
5	TOLLING ESCALLION					35	6,720	**12**	**2,240**	*0.73%*
6	ESCALLION MASH	1	1,307	1	901	0	1,023	**0.7**	**1,077**	*0.35%*
7	TOLLING PEPPER MASH					16	3,073	**5.3**	**1,024**	*0.34%*
8	GUAVA JERK SAUCE			2	932			**0.13**	**311**	*0.10%*
9	JERK SEASONING				442		129	**0.13**	**190**	*0.06%*
10	JERK SAUCE			2	546		14	**0.09**	**187**	*0.06%*
11	MANGO PUREE					1	420	**0.21**	**140**	*0.05%*
12	MANGO CARROT DRINK	0	369					**0.00**	**123**	*0.04%*
13	SORREL JERK SAUCE			1	366			**0.02**	**122**	*0.04%*
14	JUNE PLUM CONCENTRATE	0	163					**0.05**	**54**	*0.02%*
15	CARROT GINGER DRINK	0	28					**0.01**	**9**	*0.003%*
	Grand Total	**181**	**265,207**	**247**	**332,878**	**229**	**318,383**	**196**	**305,489**	***100.0%***

During the two days in Bull Savanah, the mission completed a CB2 Portfolio Analysis for the main products: ackee, carrot juice, mango nectar, and tomato ketchup representing 98% of sales.

1. Ackee is by far the most important product, as its contribution (= margin per ton x tons sold) is 65% of the total contribution of the four products. The ackee margin of $3,275 per ton (60%) is very high (although the prices have been decreasing between 2007 and 2009!). The average found in most food processing companies in the developing world is 30% margin.
2. Carrot juice is the second most important product; it earns $298 per ton (21% margin) and with an average of 82 tons sold it provides 23% of total contribution,
3. Mango nectar earns $475 per ton (36% margin) with an average sales volume of 15 ton per year it contributed 6.6%.
4. Ketchup contributes 4.7% and is a (very) risky product with gross margins between $110 and $200 per ton (13-18% margin) which is too low. A comparison with a similar ketchup maker in Kyrgyzstan (ITC project carried out there in 2007-2008) is made in the table below:

Cost in USD per ton (same bottle)	Richstem (Kyrgyzstan)	Southern Fruit (Jamaica)	Difference	Diff %
VC1	370	550	180	33%
VC2	60	80	20	26%
VC3	240	140	- 90	-64%
VC per ton	710	840	130	15%

Company Richstem, which produces ketchup on a similar scale in the same HDPE bottles has 15% lower variable cost, mostly because of the cost of their raw material and ingredients and it would be useful to see if the recipe and way of production can be improved by the ITC technologist. **(Recommendation for the next mission).**
The total contribution of the four products amounted to $108,441. The fixed cost of Southern Fruits are $251,000 per year and take into account a realistic depreciation (FC1 = $70,000), cost of capital (FC2 = $48,000) and the overhead expenses (FC3 = $137,000). Thus, with the four products, the company runs at a substantial loss of $142,892. It must be noted that the analysis needs to be completed with the other 11 products, but the average annual sales of all these products put together was less than $6,000. Because depreciation and cost of capital incur no expenses (the company has no interest bearing debts), the cash flow is minus $23,114: the company loses liquidity.

CB2 SOUTHERN FRUIT & FOOD Ltd, Bull Savanah, Jamaica										USD	AVG	2007 - 2009	
1	2	4	5	6	7	8	9	10	11	12	13	15	16
Nbr	Sheet	Sales EXW	Sales %	Margin per ton	Margin %	Volume in ton	Vol. %	Contri-bution	Contrib %	FC attrib.	Profit	BE Volume Sales	BE Volume RM
1	ACK24x19	116,956	39.0%	3,275	60%	22	13%	70,738	65.2%	163,948	- 93,210	50	216
2	CAR24x19	116,685	38.9%	298	21%	82	49%	24,422	22.5%	56,603	- 32,181	190	151
3	TOM 4x1 gal	30,862	10.3%	113	13%	35	21%	3,971	3.7%	9,204	- 5,233	81	68
4	TOM12x1lt	502	0.2%	196	18%	0.5	0%	89	0.1%	207	- 117	1.1	0.9
5	TOM8x1/2 gal	15,007	5.0%	143	14%	15	9%	2,086	1.9%	4,835	- 2,749	34	28
6	MGN24x19	20,000	6.7%	475	36%	15	9%	7,135	6.6%	16,538	- 9,402	35	35
7	JER8x1/2	-	0.0%			-	0%	-	0.0%	-	-	-	-
8	JER4x1gal	-	0.0%			-	0%	-	0.0%	-	-	-	-
9	JER 24x9	-	0.0%			-	0%	-	0.0%	-	-	-	-
10	JER 24x5 fl oz	-	0.0%			-	0%	-	0.0%	-	-	-	-
11	PEP200KG	-	0.0%			-	0%	-	0.0%	-	-	-	-
12	PEP5GAL	-	0.0%			-	0%	-	0.0%	-	-	-	-
14	ESC200KG	-	0.0%			-	0%	-	0.0%	-	-	-	-
15	ESC5GAL	-	0.0%			-	0%	-	0.0%	-	-	-	-
16	JES5GAL	-	0.0%			-	0%	-	0.0%	-	-	-	-
17	JES 4x1gl bucket	-	0.0%			-	0%	-	0.0%	-	-	-	-
18	JES24x10	-	0.0%			-	0%	-	0.0%	-	-	-	-
		300,011	100%			**169**	100%	**108,441**	100%	**251,333**	**-142,892**	**391**	**499**
											-47.6%	132%	
										CASH FLOW	- 23,114		

Analyzing the Big Four (ackee, carrot juice, mango nectar and tomato ketchup) reveals the following:

1. Very high EXW price of ackee of over $5,000 per ton.
2. Low cost of raw materials and ingredients. VC1 usually ranges from 50-80% of the total variable cost, with the exception of tomatoes.
3. Average to high cost of processing. VC2 usually ranges between 10-15%
4. High cost of packing material, VC3. The A2 tins cost $0.28 per piece, or $620 per ton of product. While this high cost may be justified for the ackee (29%), it is too high for carrot (55%) and mango juice (73%).
5. To break-even, the company needs to sell over 405 ton of product, which is 140% more than in the past three years, this involves processing 517 ton of raw material.
6. The capacity utilization (based on 3 shifts per day and maximum length of harvesting season without storage of raw material) is extremely low.

Cost	Ackee (24 x 19 oz)	Carrot juice (24 x 19 oz)	Ketchup (4 x 1 gallon)	Ketchup (12 x 1 liter)	Ketchup (8 x ½ gallon)	Mango nectar (24 x 19 oz)
P (EXW)	$ 5,415	$ 1,423	$ 881	$ 1,106	$ 1,028	$ 1,332
VC1	42%	31%	71%	60%	62%	9%
VC2	28%	14%	10%	8%	9%	19%
VC3	29%	55%	19%	31%	30%	73%
VC per ton	$ 2,140	$ 1,125	$ 756	$ 893	$ 878	$ 857
Volume	22 ton	82 ton	35 ton	0.5 ton	15 ton	15 ton
Cap. util. %	12%	4.5%	3%			0.6%

Note: VC1 = variable cost of raw material and ingredients; VC2 = cost of processing (steam, electricity, labor); VC3 = cost of packaging.

Based on this incomplete CB2 analysis, the following (draft) recommendations can be made:

1. Continue the high margin products: Ackee and Carrot Juice
2. Discontinue the low margin products: Tomato Ketchup unless the cost price can be reduced with another recipe.
3. Diversify and concentrate on the strengths: (very) low cost of raw material and process as large quantities as possible because there is ample unutilized capacity.
4. Avoid the weakness: (very) high cost of packing material. Sell in large volume packaging, preferably B2B, instead of B2C packaging.

The CB2 analysis was not completed and this makes it impossible to evaluate the potential of the new SKU and thus to plan 2010. **(Recommendation for the next mission).**

2. Industrial Products (B2B)

The strategic plan of the owners is to be a major producer of industrial products (B2B) by 2014; notably concentrated mango, tomato paste and pepper mash.

To ensure raw material supply, Southern Fruits envisages to contractually link to growers (contract farming). The typical duration of a contract will be 3 years. Currently, Southern Fruits has 20 contracted farmers who cultivate 100 hectares of land. The company itself owns 260 acres of irrigated land close to the factory and would like to produce tomato, e.g. for its own ketchup production.

Management requested the ITC team to analyze the technical, commercial and financial feasibility of this strategic choice.

Two new B2B products were analyzed:

A. Mango puree, 16 Brix in 220 kg aseptic bags in drum
B. Tomato paste, 30 Brix in 220 kg aseptic bags in drum

Mango puree 16 Brix in USD per ton	Southern Fruit, Jamaica	OGP Ltd, Kenya	Difference	Diff %
Price mango	29	76	-47	-159%
VC1 (16 Brix)	80	211	-131	-162%
VC2	118	46	72	61%
VC3 (220 kg drum)	86	85	1	1.6%
VC per ton	**285**	**342**	**-57**	**-20.2%**
Price EXW	725			
Margin per ton	434			

The mango prices quoted by factory management in the Bull Savanah area are exceptionally low: 2.9 $ct per kg. To compare: in the Tana River delta in Kenya, which is a low populated mango growing area, the price is 7.6 $ct, or 6.3 $ct for the fruit + 1.3 $ct delivery cost to the factory. Despite 61% higher processing cost, the total variable cost of the mango puree will be about $285 per ton. The current C&F price Kingston is $850-$900; assuming $125 delivery cost results in $725 EXW and a margin of $434 (60%), comparable with ackee.

The additional investment needed for an aseptic filling line and pasteurizer, including cost of needed repairs to existing equipment, engineering, delivery, construction and commissioning is estimated at $175,000 (need to get a quotation for second hand equipment from technologist. The equipment can also be used for tomato paste.

Tomato paste 30 Brix in USD per ton	Southern Fruit, Jamaica	Richstem, Kyrgyzstan	Difference	Diff %
Price tomatoes	78	57	21	27%
VC1 (30 Brix)	548	343	206	37%
VC2	102	85	17	17%
VC3 (220 kg drum)	86	144	- 58	-67%
VC per kg	737	572	165	22%
Price (current prices)	1850			
Margin per ton	1113			
Price (world market)	911			
Margin per ton	175			

The tomato prices quoted are higher than for mango, reflecting the scarcity on the market: 7.8 $ct per kg. To compare: in Kyrgyzstan the tomato price is only 5.7 $ct per kg. The processing cost VC2 are about $102 per ton and VC3 the aseptic bag, liner and the 220 kg drum cost $86 per ton of paste.
This comes to a total variable cost of $737 per ton, which is not competitive (e.g. 22% higher than Kyrgyzstan; the cost in Argentina is around $620 per ton).

Southern Fruit buys tomato paste for its ketchup at $450 per drum (J$40,480), or $1850 per ton, which is almost double the world market price of $900-$1000. It is unclear why this price is so high (**Need to get price offer for larger volumes of paste**). Obviously, the margin is extremely high and this will benefit the cost price of Southern's ketchup.

A full feasibility, including a CB4 Investment Analysis, could not be performed during the mission and needs to be done during the next intervention in 2010.

PART D – NEXT MISSION (2010)

The tasks to be completed for the next mission are:

a. Finish CB2 for all SKU's and make the 2010 planning and budget;
b. Prepare a detailed technical planning for installation of an aseptic filling line;
c. Prepare CB4 for an aseptic filling line for mango puree and tomato paste;
d. Assist to obtain a cheap local bank credit to acquire the equipment.

Profile of enterprise 2. Central Food Packers Ltd.

Address:	P.O Box 75, Kingston 6
Telephone:	876 984 31 18 or 876 984 97 52
Owners:	Mr. Paul Bravo (100%)
General Manager:	Mr. Paul Bravo
Technologist:	Mrs. Sandra Duhaney
Production:	Mr. Christopher Anthony Campbell, Alias 'Tonto'

This dynamic enterprise -the export/domestic sales ratio is 95 to 5- produces quite a large range of products. Ackee production constitutes the bread and butter of the company. Ackee is produced from June to October and from January to March. Ackee is a very labor intensive product: The company employs 300 people. The main purpose of the other productions, notably calaloo, is to keep the 300 people employed when the peak ackee season is over.

PART A – TECHNOLOGICAL REPORT

Current production range of Central food packers:

- Ackee in brine.
- Calaloo in brine.
- Breadfruit in cans.
- Bammy sticks made of cassava.
- Jams.

During the mission in June 2009 suggestions were made to reduce the use of pectin in the jam. These recommendations were put in place and a reduction of 20% or Jam $ 4.000 per batch (Jam $ 60.000 per year). The management is highly cooperative and additional suggestions for improvement are likely to be implemented shortly.

1. Product: Calaloo

Process step: Retorting

Shortcoming: Retorting time is not optimized. The retort is kept during 40 min at 240°F. The temperature in the can is never measured. As a trial, the temperature/time diagram was recorded using a sensor placed in a can located in the middle of the basket placed in the upper part of the retort i.e. in the "coolest" possible location. The obtained diagram see **Annex 1** was analyzed and the result is given in **Annex 2**.

Consequence:

(i) Overcooking up to an F-o value of 40,5 where FDA requirement is F-o minimum 2,4 whereas an F-o value of 3,0 is generally recognized as safe;
(ii) Reduced production output because the retorting time is too long;
(iii) Waste of energy and therefore money;
(iv) Unnecessary loss of quality (calaloo doesn't need a long cooking time).

Suggestion for improvement: Reduce the retorting time, step by step until minimal processing temperature/time is achieved with respect to the FDA requirement.

Outcome:

(i) Reduced retorting time with still sufficient sterilization units, including sufficient safety margin (F-o min 3,0);
(ii) Production capacity is at least doubled at no additional cost;
(iii) Reduction of fuel consumption of 30 liters of diesel per retort or an annual saving of Jam$ 2000K or USD 24.000, based on actual production figures;
(iv) Improved quality of the finished product.

Investment cost: USD 1.300 for a sensor and the needed software.

Follow-up required: Follow up is needed. The optimization must take place step by step where each step must be measured and calculated according to the excel file in **Annex 2**.

2. Product: Jam.

Process step: Dosage of pectin.

Shortcoming: The pectin dosage was already reduced by 20% but the required level has not yet been optimized experimentally. The required amount is not established in the lab.

Consequence: There is still an over dosage of pectin.

Suggestion for further improvement: A method to measure daily the required amount of pectin was demonstrated and understood for guava jelly. This procedure should be used to optimize the pectin usage in all jams and jellies. The lab manager agreed to implement this procedure.

Outcome: An acceptable jelly was produced with a pectin level of 0.6%, brix 65 and pH 3.0. At a later trial, a still acceptable jelly was obtained with a pectin level of 0,5 % (same brix & pH). This will result, after final optimization, in a further cost reduction of Jam$ 60.000-90.000 / year.

Investment cost: None.

Follow-up required: None.

3. Product: Ackee

Process step: Retort- pasteurization.

Shortcoming: Retorting time not optimized. The retort is kept during 11 min at 240°F. The temperature in the can is never measured. As a trial, the temperature/time diagram was recorded in the can, using a sensor. The obtained diagram **annex 3** was analyzed and the result is given in **Annex 4**.

Consequences: The calculated F-o value was 4.5 see **Annex 4**. FDA requires a minimum of 2.4 (rounded to 3.0). In that respect an F-o value of 4.5 could be considered as acceptable. There are little possibilities for cost reduction. In view of the fact that sterilization is a real food safety hazard (CCP), this parameter should be monitored regularly.

Suggestion for improvement: It is highly recommendable to measure regularly the temperature/time diagram inside the can with a sensor and calculate the sterilization units on a weekly basis. Different positions in the retort must be monitored and the process must be fine tuned.

Outcome: Optimized process conditions; less energy consumption (very likely) and a CCP that is controlled (certainly).

Investment cost: The sensor and software cost USD 1.500.

Follow-up required: Since the sterilization is a real CCP, further follow up is highly recommended.

4. All canned products

Packaging: Tin cans

Shortcoming: Packaging costs are extremely high and constitute 50% of production cost. (24 cans cost 700 Jam$ or 8.25 US$). This high can price is suffered by all food processors in Jamaica. Only one supplier (Crown Cork–Metal box) is active on the Jamaican market and enjoys a full monopoly. This supply problem must be addressed. It creates a big handicap for can contained Jamaican exports.

Suggestion for improvement:

1. The situation might probably be challenged if a critical mass of processors could join forces (group purchasing) to order a minimum quantity of cans abroad (20 feet container?)

2. Another alternative would be to explore the possibility of using plastic containers with aluminum pop up lids (but production of plastic containers must be local). This kind of packaging can be hand or machine sealed and the finished product can be sterilized.

Outcome: Less costly packaging.

Investment cost: None for group purchasing, to be determined for substituting plastic containers to existing cans (trials are mandatory).

PART B – MAINTENANCE

Shortcoming: There is no workshop dedicated to maintenance of equipment. Maintenance is limited to simple operations such as routine lubrication, replacement of belts, etc. Even the replacement of a ball bearing is impossible for lack of appropriate tools. There is no preventive maintenance schedule, no spare parts in inventory. Curative maintenance (in case of a breakdown) is performed by a maintenance specialist who is sub-contracted to this end and called on a need basis.
Consequence: The equipment is poorly maintained, the availability ratio is not measured but must be low, the yearly cost of maintenance for the main equipment is not known. An equipment breakdown can be dealt with rapidly if the spare part is available in Kingston, otherwise the replacement part must be imported and the down time will depend on the lead time communicated by the manufacturer: The situation is not properly managed.
Suggestion for improvement: A proper workshop dedicated to maintenance operations must be created. The workshop must be closed, windows protected and door locked to prevent foreign intrusion. A complete set of tools, wrenches, benches, vices, thermal sensor, vibration sensor, etc. allowing first level mechanical and electrical interventions must be acquired.
Mr. Robert Fuller, who is in charge of basic maintenance, must list all main equipment (i.e. equipments which when out of order prevent the production to progress) that is to say, boiler, cooker, seamer, etc. And record the following information:
Type, model, serial n°, date and country of manufacturing, name of the manufacturer.
Once corresponding data are gathered, the manufacturer (or closest authorized retail agent) will be contacted in order to obtain the list of recommended spare parts constituting the "first aid kit" that is to say the list of all wearable parts with the recommended replacement frequency calculated in work/hours. The recommendation of the manufacturer will be benchmarked against the maintenance experience accumulated by the maintenance team.The key spare parts (spare parts which are not freely available in Kingston, which have a short life span, and which unavailability could cause a severe loss of revenue due to production stoppage), will have to be acquired. If the cost of brand new spare parts is too high, the possibility of acquiring standard replacement part or second hand parts will be investigated. The proper training of the maintenance team is another key issue.
Recommendation: It is recommended that **Mr. Alwyn Lynch** from Ebony Park who is a skilled electromechanical engineer is contracted to assist in the field of:

5. Implementing a workshop with needed tools
6. Organizing the workshop (mainly 5S)
7. Assisting in listing the main spare parts to keep in inventory
8. Drafting a preventive maintenance schedule

PART C – COST OF GOODS

During the mission in December, it was not possible to implement any of the tasks set because the administrative staff was too busy with their daily work, notably salary payments. It is unknown if the simplified salary system which was introduced in June has been used and what the effects were on the workload of the Production manager.

It was agreed that **Ms**. **Tracy-Ann Buchanan** of **SRC** will make three visits to Central Food Packers and try to implement CB2 as part of her learning process the following tasks have been listed:

i. Study the draft CB2 for Central.

3. Make three appointments on Saturdays, when the workload is less heavy.
4. On the first Saturday:
    a. Teach Central staff the principles of CB1: VC's and FC's
    b. Make a list of SKU, sales volumes and prices (PORTFOLIO SHEET)
    c. Give a list of information they should collect on the VC's
5. Back in the SRC office: make the final CB2 structure (sheets, links)
6. Send to OVL for checking

7. On second Saturday:
    a. Fill the VC information in each sheet (VC1 and VC3)
    b. Calculate the VC2 (difficult)

c. Make estimates if you don't know and make them yellow, indicating the need for verification.
d. Fill the FC information with help of the bookkeeper
e. Send to OVL for checking

8. On the third day (after feedback is given) go to discuss with **Mr Paul Bravo** (next mission)

PART D NEXT MISSION (2010)

The tasks to be completed for the next mission are:

1. Verify / follow up the suggestions made for salary administration system;
2. Train management in the use of CB2 - Portfolio analysis and make a plan & budget for 2010;
3. Follow-up on retort and pasteurization (**Mrs Una Joy Williams**).
4. Follow-up on maintenance (**Mr Alwyn Lynch**).

Profile of enterprise 3. Tourejon Food Processors Ltd.

Address:	Denbigh Industrial Estate, Foga road, Denbigh, Clarendon
Owners:	Mrs. Norma Russell; Mr. Anthony Grant
Production manager:	Mr. Ian J. Campbell
Marketing/accounts:	Mrs. Tavia Riggon
Telephone:	+1 876 360 4905 (Norma Russell)
	+1 876 819 6612 (Anthony Grant)

PART A – TECHNOLOGICAL REPORT

Tourejon was still not in operation during the second visit in December. The reason given to the ITC team is that the factory was not in compliance with the governmental requirements for treatment of waste in general and waste water in particular. An anaerobic waste water treatment plant is to be constructed and approved prior to getting the administrative authorization to start production. Tourejon was at a standstill, not moving forward to a solution of the problem. In order to expedite the process, the ITC team, together with the production manager, visited **Dr. Julia Brown** of the **SRC**. Following information on how to move forward was provided:

1. SRC can make a 'waste handling plan', according to the requirements of the authorities. This will include all data required to design a waste water plant. The related cost for this service is Jam$ 55.000. This can be finished in a week after receiving the following information:
   a) A formal request sent by Tourejon through an email to SRC : juliab@src-jamaica.org
   b) 50% down payment (Jam$ 27.500) to SRC
   Once a) and b) are done, the formal procedure for requesting authorization can be launched.
2. Technical drawings of the existing waste water plant must be made. An engineering bureau (**Mr. Eustache Smith**) was visited. The drawings of the existing could be made in a period of 1 week, (necessary input have already been received from Tourejon).
3. The formal procedure at SRC level takes (normally) 12 weeks. During that time the production cannot operate. However, the construction of a waste water plant can be started and finalized quickly, SRC can speed up the procedure and reduce the time required to approximately 8 weeks. The corresponding cost is Jam$ 30.000.
4. Tourejon needs an anaerobic waste water treatment plant. This can be either a reactor (closed system) or a lagoon (open air). The cost for a reactor is not known at present, it will depend on the outcome of the study to be performed under SRC supervision.

Conclusion: If the above described procedure is followed, Tourejon can start production operations within 10-14 weeks.
Follow-up required: The procedure is simple and transparent. No further assistance is needed.

PART B – COST OF GOODS

An initial CB1 training was given to **Mrs. Tavia Riggon**, who quickly grasped the ideas and principles. The main purpose of the CB1 calculation was to establish the gross margins of their principle products (sweet potato, yam and Irish potato). It turned out that, at the actual purchase prices, the margins would be too low to sustain the fixed costs.

A second calculation demonstrated that the purchase prices, delivered to the factory, have to be reduced significantly (in the case of yam from J$60 to J$39) to obtain the target 30% gross margin. The production process and technology used leave very little room for other margin adjustments than prices: either sell more expensively (superior quality, packaging and branding) or purchase more cheaply.

CB1 TOUREJON					
Vacuum packed Yam in 5 lb PE bags, 8 in a carton box.					
	JMD per Lb			**JMD per year**	
Price (Delivered Kingston)	128		Total Revenue	54,507,600	
GCT, 16.5%	18		Total Cost	69,535,546	
Transport, sales commission 0%	9		**Profit Before Tax**	**- 15,027,946**	
Price (EXW)	**101**		Profitability %	-28%	
Price (Raw Material, delivered factory)	60		Asset value	129,000,000	
Processing ratio	1.33		Depreciation %	10.0%	
Raw Material cost	80	*81%*	**FC1**	**12,900,000**	*27%*
	4	*4%*			
VC1	**84**	*85%*	Debt (40% of Asset value)	77,400,000	
			Interest rate	10.0%	
Production cost per hour (steam, electricity)	2,920		**FC2**	**7,740,000**	*16%*
Production volume per hour (lbs/hour)	600				
VC2	**5**	*5%*	Number of FTE employed	15	
			Salaries staff incl. social taxes	18,000,000	*37%*
			Other overhead, repairs, maintenance	10,000,000	*21%*
Cost of packing (PE bag, carton, labels)	395		**FC3**	**28,000,000**	*58%*
Number of pounds per carton	40				
VC3	**10**	*10%*	**FC**	**48,640,000**	*100%*
			FC % attributed to product	33.0%	
VC	**99**	*100%*	**FC (attributed to product)**	**16,051,200**	
Gross margin	**2**		Volume sold q (ton)	540,000	
Gross margin %	2%		**Contribution**	**1,023,254**	
			Break even volume (sales)	**8,470,668**	
Fixed Cost / q	**30**	*23%*	Break even volume (raw material)	11,294,224	
Total Cost / q	**129**	*100%*	Output capacity in pounds per hour	600	
			Working hours per day	22	
Profit / q	**- 28**		Length of harvesting season in days	360	
			Max. output capacity per year	**4,752,000**	
			Capacity utilization %	11%	

Since all marketing activities have yet to start and in view of the competition for these straight forward products, the conclusion is that the company must primarily focus on procuring raw material at lower prices. This will make it indispensable to enter into contract farming, or even farm themselves. The break even volume for yam, at J$39 is 716,000 lbs (325 ton) which at 18,000 lbs per acre (20 ton/ha) is equivalent to a farm of 38 acres (15 hectares).

CB1 TOUREJON					
Vacuum packed Yam in 5 lb PE bags, 8 in a carton box.					
	JMD per Lb			**JMD per year**	
Price (Delivered Kingston)	128		Total Revenue	54,507,600	
GCT, 16.5%	18		Total Cost	54,415,546	
Transport, sales commission 0%	9		**Profit Before Tax**	**92,054**	
Price (EXW)	**101**		Profitability %	0%	
Price (Raw Material, delivered factory)	39		Asset value	129,000,000	
Processing ratio	1.33		Depreciation %	10.0%	
Raw Material cost	52	*73%*	**FC1**	**12,900,000**	*27%*
	4	*6%*			
VC1	**56**	*79%*	Debt (40% of Asset value)	77,400,000	
			Interest rate	10.0%	
Production cost per hour (steam, electricity)	2,920		**FC2**	**7,740,000**	*16%*
Production volume per hour (lbs/hour)	600				
VC2	**5**	*7%*	Number of FTE employed	15	
			Salaries staff incl. social taxes	18,000,000	*37%*
			Other overhead, repairs, maintenance	10,000,000	*21%*
Cost of packing (PE bag, carton, labels)	395		**FC3**	**28,000,000**	*58%*
Number of pounds per carton	40				
VC3	**10**	*14%*	**FC**	**48,640,000**	*100%*
			FC % attributed to product	33.0%	
VC	**71**	*100%*	**FC (attributed to product)**	**16,051,200**	
Gross margin	**30**		Volume sold q (ton)	540,000	
Gross margin %	30%		**Contribution**	**16,143,254**	
			Break even volume (sales)	**536,921**	
Fixed Cost / q	**30**	*29%*	Break even volume (raw material)	715,894	
Total Cost / q	**101**	*100%*	Output capacity in pounds per hour	600	
			Working hours per day	22	
Profit / q	**0**		Length of harvesting season in days	360	
			Max. output capacity per year	**4,752,000**	
			Capacity utilization %	11%	

It is necessary to make a special CB1 for raw material farming, to calculate if the target purchase price of J$39 will give an acceptable profitability to the farmers.

PART C – NEXT MISSION (2010)

The tasks to be completed for the next mission are:

1. Cost of goods calculations for sweet potato, yam and potato farming in CB1;
2. Prepare a raw material procurement plan to achieve optimal capacity utilization throughout the year, including post harvest potato storage;
3. Recalculate CB1 for the main products and prepare plan and budget for 2010 - 2012;

Profile of enterprise 4. Spur-Tree Spices Jamaica Ltd

Address:	1, Woodglen Drive Kingston 10 Jamaica
Telephone:	+1 876 9294356
Directors:	Mr. Dennis Hawkins, alias Mr H.
	Mr. Mohan Jagnarin
Production:	Mr. Taylor, alias Mr T.
Accounts:	Mrs. Chaya Hawkins, alias Mrs. H.
External auditor:	Mr. Anton Whych (+1 876 421 170)

Spur-Tree is a fast expanding medium size company established in 2006. The company is producing two categories of finished products:

- Sauces and seasoning in HDPE jars/buckets and glass bottles (jerk, BBQ, curry, pepper sauces, etc.) for export and local market;
- Vacuum packed rotis and fritters (curry chicken, spicy fish, etc.) for the local market.

During the December mission, the second production line was stopped, because local market demand dwindled. It now concentrates on exporting jerk sauces and seasonings under their own Spur Tree label. The company found a market for its products in the USA

PART A – TECHNOLOGICAL REPORT

Spur Tree makes excellent and exclusive products but faces microbiological problems. Once these problems are solved, the potential for growth is high. The electricity bill was also analyzed on specific request of the management.

1. Product: Jerk Seasoning

Process step: Preparation (1).

Shortcoming: The microbiological count of the finished product is up to 100.000 CFU per gram. A potential new customer can only accept a maximum count of 10.000 CFU per gram. The microbiological contamination is not measured at the different steps of the process.

Consequences: The fact that the end product is highly contaminated is known but the source of the contamination is not known.

Suggestion for improvement: Sample & analyze for Total Plate Count (TPC) following takings:

- All individual ingredients at the time of adding each of them to the preparation.
- The mixed preparation after adding all the ingredients.
- The finished preparation before transferring to the filler.
- The finished preparation in the filler.
- The finished product after the filler.

Outcome: As a result of the analyses it will be possible to identify the main sources of contamination. Depending on the outcome, adequate actions must be taken.

Investment cost: Total cost for the analyses: Jam$ 50.000.

Follow-up required: Spur Tree will need further assistance as soon as the result of the analyses is available. The corrective actions must be advised on.

Process step: Preparation (2).

Shortcoming: The microbiological count of the finished product is up to 100.000 CFU per gram. Pimento is the only ingredient that is not washed before grinding.

Consequences: Unwashed pimento might contribute heavily to the unacceptable high microbial load in the end product.

Suggestion for improvement: Wash the pimento in chlorinated water and dry it, (solar drying) before grinding. Measure the TPC of the pimento powder before and after washing.

Outcome: A possible reduction of the microbiological load in the end product.

Follow-up required: Spur tree will need further assistance as soon as the result of the analyses is available.

Process step: Equipment cleaning

Shortcoming:

1. Equipment is not adequately washed and sanitized. Decomposing product have been found in outlet valve of the blending equipment 'Bredo'.

2. There are no tools for quickly dismantling pipes for proper sanitation of the equipment after a batch has been produced.

Consequences: Unacceptable high microbial load in the end product.

Suggestion for improvement:

1. Acquire spare parts and basic tools for dismantling pipes. Provide a proper storage area for spare parts and tools. Acquire a chlorine meter. Acquire a set of spare parts for the valves in order to replace wearable parts without stopping production.

2. After each production batch the equipment must be washed during 20 minutes with NaOH (1%) solution at 70°C. All parts that cannot be cleaned with simple washing must be dismantled at the end of every day. Place all dismantled parts in chlorinated water (200 ppm, room temperature) and keep the dismantled parts submerged until they will be used again.

3. Before the blender is used again, the sanitized dismantled parts must be mounted and the machine should be disinfected with chlorinated water (200 ppm, room temperature) during approximately 20 minutes. Use a chlorine meter to ensure that the level of free chlorine is maintained at 200 ppm.

Outcome: Reduced microbial load of the end product. It is likely that the contamination during processing will be reduced to an absolute minimum.

Investment cost: Cost of spare parts and basic tools and chlorine meter.

Follow-up required: Spur Tree will need further assistance to optimize the processing equipment.

Process step: Pasteurization

Shortcoming: No pasteurization process was reported

Consequence: High microbial count in finished product.

Suggestion for improvement: Pasteurize the bulk produced at 175°F (80°C) for 30 seconds and immediately fill it into sterilized bottles. Cap tightly with sterilized caps and cool down immediately.

Outcome: All yeast and pathogenic bacteria will be eliminated. It is likely that the TPC will be reduced by 80%.

Investment cost: The process can be conducted in the blender. It will take circa. 20 minutes to reach the right temperature. If the equipment is not available because the production load is to high, a 'Scraped Surface Heat Exchanger' must be installed. Cost: Jam$: 200.000.

Follow-up required: Spur Tree will definitely need further assistance to optimize the pasteurization process.

2. Electricity bill

The electricity bill was analyzed and following observations and recommendations can be made:

Observation:

1. The cost of electricity is extremely high: J$ 27 (or US$ 0.31) per KWH. Compared with the average European cost this is twice as much…

2. The "efficiency coefficient" for the use electricity (Cosinus Fi) is not measured and hence not optimized.

Recommendation:

1. At J$ 27 per KWH it becomes attractive to search for alternative power supply. In **Annex 7** of this report a cost calculation for the following alternative options has been made:

(i) Generate electricity by using a diesel generator,

(ii) Generate electricity by using a propane (LPG) generator ,

(iii) Generate electricity by using photovoltaic solar panels.

2. The efficiency coefficient (cosines Fi) should be measured. This can be done quickly by an electrician. The corresponding lost power (also called 'blind power') and corresponding potential savings can be calculated and corrective measures implemented (corrective measures turn on

classically on the installation of condensators -capacitive power-). A pay back calculation can then be carried out.

Conclusion:

Based on the cost of diesel, LPG and photo voltaic cells and based on the KWH generated and the corresponding cosinus Fi, the following can be concluded:

a) The use of LPG (Propane) as energy source in a power generator is more expensive than using public power supply. This is based on the cost of LPG (J$ 56,3 per pound and the expected production of 1.5 KWH per pound; In addition to that the running cost of an LPG generator is two times higher than operating a Diesel generator: LPG is not an attractive choice.

b) A diesel generator is a good option. The operating cost is relatively low and the total cost per KWH is 13% lower than the cost per KWH of the public supply.

c) The cheapest solution lies in photovoltaic cells (solar panels). The cost is calculated based on a seven year production of electric power -although the life expectation of solar panels is longer than 7 years- . In the present case, the investment in photovoltaic cells has a pay back of 2.5 years (not taking into account the interest rates applicable to the capital expenditure).

PART B – STOCK MANAGEMENT

Shortcoming: The young age and the fast growth of the enterprise prevented a timely and smooth development of all its processes. Rightly so, the priority was made on sales, marketing and production. Now, the time has come to improve the management of some other sectors. Stock management is one of them. Sourcing is the first step to secure in order to guarantee good manufacturing conditions i.e. the right quantity of the right finished product is turned out at the right time because all needed ingredients and packaging material are available on time. This aspect of operations can be improved.

Consequence: Production and Financial burden: some ingredients or materials are out of stock, some others are purchased in too large (or too small) quantity because there is no economic re-ordering quantity calculated.

Suggestion for improvement: A stock management system has to be put in place. To this end some data and information are needed:

- List of all SKUs;
- Volume of sales (past 12 months) for all SKUs
- Bill of material of all SKUs (ideally with code n° to consolidate common components)
- Purchasing price of each primary component
- Bill of ingredients (recipe) for each category of finished product
- Volume of sales (past 12 months) for each category of finished product
- Purchasing price of each primary ingredient
- Rolling production forecast (12 months)

Follow-up required: The cost of goods calculation which is currently pursued will be a major data provider. The rolling production forecast (excel based) will have to be jointly discussed & developed.

PART C – COST OF GOODS

The turnover reached $230,000 in 2008 and is expected to reach $350,000 in 2009. The export demand for the jerk and curry products is growing but it needs strong merchandising. Supermarket promotion and taste testing is a costly affair but the owners of Spur tree are confident that this is the way to go forward and that it will pay off with higher sales volumes. The company started off by selling large packing units (1 gallon) for a B2B market, but recently launched consumer packing (B2C). The cost of imported bottles is very high and this puts the margins under pressure. But the Spur Tree label is gaining in name recognition and can command a higher price. On the local market, the company faces erratic ordering from their largest supermarket clients who try to keep their own inventory levels as low as possible (JIT ordering).

It is a major challenge for the company to cope with the increased (and erratic) growth in demand. Notably because the key ingredients scotch bonnet (yellow) pepper, red pepper, and scallion are seasonal and sometimes in short supply. The solution the company applies is to produce intermediate products (like yellow pepper mash preserved in salt) when the raw material is available. This buffer stock obviously adds to the production cost but ensures supply in critical production moments.

Spur Tree produces 21 different intermediate products for 27 finished products (27 SKUs). Production planning, ingredient ordering and stock keeping are growing more and more important and needs to be systematized and documented. CB3 is designed for this purpose.
Introduction of Cigar Box 3 follows CB1 and CB2 and usually takes 3 to 6 months. This lied beyond the scope of the December mission. To meet the immediate requirements of the company, the focus was on CB2 and simultaneously developing Form 41 of CB3 (see below & next page).

1. CIGAR BOX CB2

All 27 SKUs of Spur Tree were listed. From 12 of them a CB1 sheet could be made during the mission resulting in the (incomplete) CB2 table below. The external auditor, **Mr. Anton Whych** was taught the principles of CB1 and CB2 and since he has good command of Excel he was instructed to complete CB2 with the remaining 15 SKUs. During the next mission a full analysis will then be made and a plan and budget for 2010 prepared.

CB2 SPUR TREE, KINGSTON, JAMAICA			JMD							
1	2	3	4	5	6	7	8	9	10	11
Nbr	Sheet	Description	Sales	Sales %	Margin per ton	Margin %	Volume	Vol. %	Contribution	Contrib %
1	CURRY 24x10 oz	ST Curry in 10 oz glass bottle, 24 in carton box (15 lbs)	2,185,950	14.5%	94	49%	11,505	10.7%	1,080,693	14.1%
2	CURRY 12x1	ST Curry in 1 kg HDPE bottles, 12 in carton box (26.46 lbs)	2,723,364	18.1%	67	53%	21,614	20.2%	1,454,904	19.0%
3	CURRY 4x4	ST Curry in 4 kg HDPE bottles, 4 in carton box (35.27 lbs)	1,595,812	10.6%	60	52%	13,757	12.8%	826,230	10.8%
4	CURRYHC 24x9.5	Home Choice Curry in 9.5 oz glass jar, 24 in carton box (14.25 lbs)	16,245	0.1%	42	44%	171	0.2%	7,099	0.1%
5	JERK 24x10oz	Premium Jerk (US Blend) in 10 oz glass bottle, 24 in carton box (15 lbs)	1,415,010	9.4%	103	51%	7,005	6.5%	724,777	9.5%
6	JERK 12x1	Premium Jerk (US Blend) in 1 Kilo HDPE Jar, 12 in carton box (26.46 lbs)	1,880,046	12.5%	67	54%	14,921	13.9%	1,006,744	13.2%
7	JERK 4x4	Premium Jerk (US Blend) in 4 Kilo HDPE Jar, 4 in carton box (35.27 lbs)	3,162,856	21.0%	60	52%	27,266	25.4%	1,641,889	21.5%
8	JERK 4x9	Premium Jerk (US Blend) in 9 pound PP buckets, 4 per carton (36 lbs)								
9	JERK 1x47	Premium Jerk (US Blend) in 47 pound PP bucket								
10	LJERK 24x10oz	Local Jerk (Local Blend) in 10 oz glass bottle, 24 in carton box (15 lbs)	152,000	1.0%	82	43%	800	0.7%	65,522	0.9%
11	LJERK 4x4	Premium Jerk (Local Blend) in 4 Kilo HDPE Jar, 4 in carton box (35.27 lbs)		0.0%				0.0%	-	0.0%
12	LJERKHC 24x9.5	Home Choice Jerk (Local Blend) in 9.5 oz glass bottle, 24 in carton box (14.25 lbs)	95,000	0.6%	82	43%	500	0.5%	40,951	0.5%
13	JERKIS 24x10oz	Island Spice Jerk in 10 oz glass bottle, 24 in carton box (15 lbs)	155,800	1.0%	82	43%	820	0.8%	67,160	0.9%
14	JERKTR 1x30	Jerk Trinidad, in PE bag of 30 lbs, 1 per box (30 lbs)	155,800	1.0%	82	43%	820	0.8%	67,160	0.9%
15	PSCR 24x5 fl oz	Pepper Sauce Crushed Red (Local Blend) in 5 fl oz glass bottle, 24 in carton box (8.25 lb	1,520,570	10.1%	82	43%	8,003	7.5%	655,466	8.6%
16	PSCRIS 24x5 fl oz	Pepper Sauce Crushed Red (Island Spice) in 5 fl oz glass bottle, 24 in carton box (8.25 lbs)								
17	PSCR 1x45	Pepper Sauce Crushed Red in 45 PP bucket								
18	PSCRHC 24x9.25	Home Choice Pepper Sauce in 9.5 oz glass bottle, 24 in carton box (14.25 lbs)								
19	PSYE 24x5 fl oz	Pepper sauce scotch bonnet								
20	PSYEIS 24x5 fl oz	Pepper sauce scotch bonnet (Island Spice)								
21	PSCL 24x5 fl oz	Pepper sauce classic (LASCO)								
22	PSDRIS 24x5 flo oz	Island Spice Pepper sauce Dragon								
23	PJEL 12x210g	Pepper jelly								
24	BBQ 4x4	BBQ Grace								
25	PM 1x40	Pepper mash								
26	PATTYM 1x45	Patty mix mild								
27	PATTYS 1x45	Patty mix spicy								
			15,058,453	100%	**71.3**	**50.7%**	**107,182**	100%	**7,638,596**	100%

2. F41

Form 41 was isolated from Cigar Box 3. In the columns all 27 SKUs are entered and in the rows the inputs used: Raw Material, Ingredients, Packing Material and Consumables. The unit of measurement was standardized at 1 pound. All input prices were thus converted to 1 pound of the respective SKU. The table below displays a part of the input utilization matrix.

F41 SPUR TREE, KINGSTON, JAMAICA

									1	2	3	4	5	6	7	8	9
Nbr	Ingredient	Group	UOM	Price per unit	Process Ratio	Weight of unit in lb	Price per lb		CURRY 24x10 oz	CURRY 12x1	CURRY 4x4	CURRYHC 24x9.5	JERK 24x10oz	JERK 12x1	JERK 4x4	JERK 4x9	JERK 1x47
	Units per carton box								24	12	4	24	24	12	4	24	1
	Unit weight in pounds								0.625	2.2046	9.4	0.59375	0.625	2.2046	8.8184	9	47
	Carton box weight in pounds								15	26.4552	37.6	14.25	15	26.4552	35.2736	216	47
1	Scallion peeled	SP	lbs	80.00	1.15	1.0	92.00		6.93%	6.93%	6.93%	6.93%	5.16%	5.16%	5.16%	5.16%	5.16%
2	Onion peeled	SP	lbs	38.00	1.40	1.0	53.20		35.13%	35.13%	35.13%	35.13%	50.78%	50.78%	50.78%	50.78%	50.78%
	Last Raw Material																
1	Betapak curry powder	Ingredient	lbs	156.00	1.00	1.0	156.00		5.26%	5.26%	5.26%	5.26%					
2	Caramel 52	Ingredient	lbs	56.67	1.00	1.0	56.67						1.41%	1.41%	1.41%	1.41%	1.41%
3	Corn starch	Ingredient	lbs	49.95	1.00	1.0	49.95										
4	Garlic powder	Ingredient	lbs	167.40	1.00	1.0	167.40										
	Last Ingredient																
1	Glass bottle 10 oz	Packaging	pieces	20.50					1.6				1.6				
2	Cap 10 oz bottle	Packaging	pieces	5.71					1.6				1.6				
3	Seal 10 oz bottle	Packaging	pieces	0.09					1.6				1.6				
4	Label 10 oz, Curry	Packaging	pieces	3.23					1.6								
5	Label 10 oz, Jerk US	Packaging	pieces	3.23									1.6				
6	Label 10 oz, Jerk Local blend	Packaging	pieces	3.23													
7	Label 10 oz, Island Spice	Packaging	pieces	3.23													
8	Carton box 24x10 oz	Packaging	pieces	52.00					0.06667				0.06667				
9	Partitions	Packaging	pieces	40.00					0.06667				0.06667				
10	HDPE jar 1 kg, incl. cap	Packaging	pieces	17.25						0.4536				0.4536			
11	Label 1 kg jar, Curry	Packaging	pieces	3.46						0.4536							
12	Label 1 kg jar, Jerk US	Packaging	pieces	3.46										0.4536			
13	Carton box 12x1 kg	Packaging	pieces	35.25						0.0378				0.0378			
	Last packaging																
1	Caustic soda	Consumable															
	Last consumable																

Once input volumes and prices are entered, Form 41 automatically returns the cost of goods in the standardized unit. VC1 is divided into the cost of the raw material and the cost of the other ingredients. VC3 sums primary and secondary packing material cost. No VC2 costs were entered as yet. From the table below it is clearly shown how expensive the packing cost of B2C products are compared to B2B: VC3 of Curry Sauce in 10 oz glass bottles (24 bottles in a carton box) 50.1% of the cost and VC3 of the bulk packing (B2B) is only 12-17%.

F41 SPUR TREE, KINGSTON, JAMAICA

					VC1 (RM)	39.09	39.09	39.09	39.09	49.33	49.33	49.33	49.33	49.33
					VC1 (Ing)	14.12	14.12	14.12	14.12	8.67	8.67	8.67	8.67	8.67
					VC3 (Pack)	53.38	10.73	7.21	-	53.38	10.73	7.69	19.86	9.57
					VC3 %	50.1%	16.8%	11.9%	0.0%	47.9%	15.6%	11.7%	25.5%	14.2%
						1	2	3	4	5	6	7	8	9
Nbr	Ingredient	Group	UOM	Price per unit	Process Ratio	CURRY 24x10 oz	CURRY 12x1	CURRY 4x4	CURRYH C 24x9.5	JERK 24x10oz	JERK 12x1	JERK 4x4	JERK 4x9	JERK 1x47
1	Scallion peeled	SP	lbs	80.00	1.15	6.38	6.38	6.38	6.38	4.75	4.75	4.75	4.75	4.75
2	Onion peeled	SP	lbs	38.00	1.40	18.69	18.69	18.69	18.69	27.01	27.01	27.01	27.01	27.01
	Last Raw Material													
1	Betapak curry powder	Ingredient	lbs	156.00	1.00	8.21	8.21	8.21	8.21	-	-	-	-	-
2	Caramel 52	Ingredient	lbs	56.67	1.00	-	-	-	-	0.80	0.80	0.80	0.80	0.80
3	Corn starch	Ingredient	lbs	49.95	1.00	-	-	-	-	-	-	-	-	-
4	Garlic powder	Ingredient	lbs	167.40	1.00	-	-	-	-	-	-	-	-	-
	Last Ingredient													
1	Glass bottle 10 oz	Packaging	pieces	20.50		32.80	-	-	-	32.80	-	-	-	-
2	Cap 10 oz bottle	Packaging	pieces	5.71		9.14	-	-	-	9.14	-	-	-	-
3	Seal 10 oz bottle	Packaging	pieces	0.09		0.14	-	-	-	0.14	-	-	-	-
4	Label 10 oz, Curry	Packaging	pieces	3.23		5.17	-	-	-	-	-	-	-	-
5	Label 10 oz, Jerk US	Packaging	pieces	3.23		-	-	-	-	5.17	-	-	-	-
6	Label 10 oz, Jerk Local blend	Packaging	pieces	3.23		-	-	-	-	-	-	-	-	-
7	Label 10 oz, Island Spice	Packaging	pieces	3.23		-	-	-	-	-	-	-	-	-
8	Carton box 24x10 oz	Packaging	pieces	52.00		3.47	-	-	-	3.47	-	-	-	-
9	Partitions	Packaging	pieces	40.00		2.67	-	-	-	2.67	-	-	-	-
10	HDPE jar 1 kg, incl. cap	Packaging	pieces	17.25		-	7.82	-	-	-	7.82	-	-	-
11	Label 1 kg jar, Curry	Packaging	pieces	3.46		-	1.57	-	-	-	-	-	-	-
12	Label 1 kg jar, Jerk US	Packaging	pieces	3.46		-	-	-	-	-	1.57	-	-	-
13	Carton box 12x1 kg	Packaging	pieces	35.25		-	1.33	-	-	-	1.33	-	-	-
	Last packaging													
1	Caustic soda	Consumable				-	-	-	-	-	-	-	-	-
	Last consumable													

Form 41 is also used for production planning. The number of cases (or any unit of sales) is entered in the top row and F41 returns the quantity of inputs needed as well as the amount of money. F41 can be used for the annual planning but is normally used to calculate weekly orders. To achieve this, the existing stocks of inputs must be deducted from the quantities needed. This adaptation was not yet finished at the end of the December mission and is to be completed during the next mission.

F41 SPUR TREE, KINGSTON, JAMAICA

								Target Sales in cases	**350**	**100**	**100**	**70**	**80**	**1,200**
								Target Sales in units	8,400	1,200	400	1,680	1,920	14,400
								Target Sales 2010 in pounds	5,250	2,646	3,760	998	1,200	31,746
									1	2	3	4	5	6
Nbr	Ingredient	Group	UOM	Price per unit	Process Ratio	Qty	Unit	ORDER VALUE	CURRY 24x10 oz	CURRY 12x1	CURRY 4x4	CURRYH C 24x9.5	JERK 24x10oz	JERK 12x1
	Units per carton box								24	12	4	24	24	12
	Unit weight in pounds					**Total**		**3,324,468**	0.625	2.2046	9.4	0.59375	0.625	2.2046
	Carton box weight in pounds								15	26.4552	37.6	14.25	15	26.4552
1	Scallion peeled	SP	lbs	80.00	1.15	**2,577**	lbs	**237,073**	364	183	261	69	62	1,638
2	Onion peeled	SP	lbs	38.00	1.40	**21,175**	lbs	**1,126,522**	1,844	929	1,321	350	609	16,121
	Last Raw Material													
1	Betapak curry powder	Ingredient	lbs	156.00	1.00	**666**	lbs	**103,826**	276	139	198	52	-	-
2	Caramel 52	Ingredient	lbs	56.67	1.00	**465**	lbs	**26,326**	-	-	-	-	17	448
3	Corn starch	Ingredient	lbs	49.95	1.00	**-**	lbs	**-**	-	-	-	-	-	-
4	Garlic powder	Ingredient	lbs	167.40	1.00	**-**	lbs	**-**	-	-	-	-	-	-
	Last Ingredient													
1	Glass bottle 10 oz	Packaging	pieces	20.50		**10,320**	pieces	**211,560**	8,400	-	-	-	1,920	-
2	Cap 10 oz bottle	Packaging	pieces	5.71		**10,320**	pieces	**58,927**	8,400	-	-	-	1,920	-
3	Seal 10 oz bottle	Packaging	pieces	0.09		**10,320**	pieces	**929**	8,400	-	-	-	1,920	-
4	Label 10 oz, Curry	Packaging	pieces	3.23		**8,400**	pieces	**27,118**	8,400	-	-	-	-	-
5	Label 10 oz, Jerk US	Packaging	pieces	3.23		**1,920**	pieces	**6,198**	-	-	-	-	1,920	-
6	Label 10 oz, Jerk Local blend	Packaging	pieces	3.23		**-**	pieces	**-**	-	-	-	-	-	-
7	Label 10 oz, Island Spice	Packaging	pieces	3.23		**-**	pieces	**-**	-	-	-	-	-	-
8	Carton box 24x10 oz	Packaging	pieces	52.00		**430**	pieces	**22,360**	350	-	-	-	80	-
9	Partitions	Packaging	pieces	40.00		**430**	pieces	**17,200**	350	-	-	-	80	-
10	HDPE jar 1 kg, incl. cap	Packaging	pieces	17.25		**15,600**	pieces	**269,100**	-	1,200	-	-	-	14,400
11	Label 1 kg jar, Curry	Packaging	pieces	3.46		**1,200**	pieces	**4,150**	-	1,200	-	-	-	-
12	Label 1 kg jar, Jerk US	Packaging	pieces	3.46		**14,400**	pieces	**49,794**	-	-	-	-	-	14,400
13	Carton box 12x1 kg	Packaging	pieces	35.25		**1,300**	pieces	**45,825**	-	100	-	-	-	1,200
	Last packaging													
1	Caustic soda	Consumable					-	**-**						
	Last consumable													

PART D – NEXT MISSION (2010)

The tasks to be completed for the next mission are:

1. Finish CB2 and the 2010 planning and budget
2. Finish F41 operational planning and stock keeping module.
3. Follow-up on retort and pasteurization.
4. Finish stock management planning and rolling production forecast scheme

Profile of enterprise 5. Canco Ltd

Address:	Suite #25 2 1/2 Kingsway Kingston 10, Jamaica
Telephone:	+1 876 968 1866
Owners:	Norman Mc Donald (100%) and his son Bronson Mc Donald
General Manager:	Mrs. Norman Mc Donald
Procurement:	Steve Barnes
Production:	Patrick Buchanan
Engineering:	Dennis Mc Indo

Canco Ltd was created in 1987. The factory is located in St Thomas. The company is producing a vast range of canned products. It is one of the main producers of ackee in brine in Jamaica.

PART A – TECHNOLOGICAL REPORT

Canco produces following products:

- Ackee in brine (65%).
- Calaloo in brine (25%)
- Canned soups (5%)
- Jams and jellies (5%)

During the mission of December 2009 only the production of Ackee was analyzed.

1. Product: Ackee

Process step: Incoming goods control (1).

Shortcoming: Circa 20 to 30% of the incoming fruit is rejected because it was harvested immature. This leads to unacceptably high levels of hypoglycine, a chemical that causes vomiting disease, typically found in unripe ackee. FDA limit is 100 ppm and unripe fruit can reach much higher levels. Rejection of the fruit takes place only after four days of in plant ripening. At that stage the fruit that does not open is rejected.

Consequence: Financial losses but also losses in turn over as the demand is bigger than the production capacity.

Suggestions for improvement:

1. There is very little knowledge about hypoglycine and on how to control its level. There is no method available to check the degree of ripeness. In cooperation with a research center a fast method to measure the degree of ripeness or the level of hypoglycine must be developed, please refer to the attached **Concept paper for improving the knowledge of the ackee fruit**.

2. Alternatively only fully ripened fruit, already opened should be purchased. This requires an internal change of organization because fully opened fruit must be processed within 12 hours.

Outcome: If a reliable, cheap and non destructive test measuring hypoglycine level could be developed, the volume of the business would increase by ca. 30%. The entire industry would benefit from this break-through.

Investment cost: To be determined

Follow-up required: It is clear that Canco alone does not have the resources to conduct this research. Intensive further assistance is required.

Process step: Incoming goods control (2).

Shortcoming: Suppliers are paid by 'volume' and not by weight.

Consequence: This makes yield calculations and supplier comparisons impossible.

Suggestion for improvement: Pay suppliers by weight. Measure the achieved yield and compare the performance of each supplier (batch organization). At regular time intervals the major suppliers should receive a feed-back on their measured performance.

Outcome: The major suppliers will be triggered to perform better and an incentive mechanism should encourage them to improve their results.

Investment cost: None

2. Product: All products

Process step: Retort- pasteurization.

Shortcoming: The temperature inside the can is never measured. Following time-temperature procedure is applied:

- Ackee: 11 min at 250°F (121°C)
- Callaloo: 35 min at 250°F
- Soup: 60 min at 250°F.

Pasteurization and sterilization of products with a pH higher than 4.4, are definitely a real CCP according to HACCP principles. Therefore corresponding processes MUST be managed accordingly.

Consequence: At present it is not possible to say whether the sterilization (or pasteurization) time-temperature diagram is correct. It can be too long (time wise) / too high (t° wise) or too short (time wise) / too low (t° wise) or it can be correct. This uncertainty can either be a safety hazard -with a serious risk of clostridium botilicum- or a waste of energy and quality. It is more than likely that the sterilization regime of soups is far too long.

Suggestion for improvement: During the mission, the temperature/time diagram for ackee was checked: A sensor has been placed inside a can of ackee and the sterilization parameters recorded see **Annex 5**. Afterwards the heat load, pasteurization units and F-o value were calculated. The result is given in **Annex 6** 'Jam Canco Ackee PU calculator'.

Outcome: The F-o value recorded is 11.8. The minimum required by the FDA standard is 2.4 (whereas an F-o value of 3.0 is generally recognized as sufficient from a food safety view point). The ackee was 'over sterilized' with a factor 4. It is clear that further tests are needed but an energy saving of 50% is clearly within reach, last but not least, a significant quality improvement can be achieved.

Investment cost: The sensor and soft ware cost USD 1.500.

Follow-up required: additional tests must be conducted for ackee, similar tests must be conducted for all finished products which are sterilized or pasteurized.

3. Product: Jams and jellies.

Process step: Recipes.

Shortcoming: The pectin dosage is far too high. The required amount is not tested in the lab.

Consequence: Over dosage of pectin (which is a very costly ingredient) of minimum 0.2%.

Suggestion for improvement: A method to daily measure the required amount of pectin was explained and understood. The former lab manager agreed to implement the test and did all needed lab research. Still the optimization was not implemented at the time of the December mission.

Outcome: Cost saving and better quality.

Investment cost: None.

Follow-up required: It is in the best interest of Canco to implement the suggested optimization as soon as possible. Further assistance in this field can be provided if Canco is interested by implementing this improvement.

4. All canned products:

Packaging: Tin cans

Shortcoming: Packaging costs are extremely high and constitute 50% of production cost. (24 cans cost 700 Jam$ or 8.25 US$). This high can price is suffered by all food processors in Jamaica. Only one supplier (Crown Cork–Metal box) is active on the Jamaican market and enjoys a full monopoly. This supply problem must be addressed. It creates a big handicap for can contained Jamaican exports.

Suggestion for improvement:

1. The situation might probably be challenged if a critical mass of processors could join forces (group purchasing) to order a minimum quantity of cans abroad (20 feet container?)

2. Another alternative would be to explore the possibility of using plastic containers with aluminum pop up lids (but production of plastic containers must be local). This kind of packaging can be hand or machine sealed and the finished product can be sterilized.
Outcome: Less costly packaging.
Investment cost: None for group purchasing, to be determined for substituting plastic containers to existing cans (trials are mandatory).

PART B – STOCK MANAGEMENT & MAINTENANCE

1. Stock management

Shortcoming: Stock management and re-supply planning is a key managerial dimension if one ambition to guarantee good manufacturing conditions i.e. turning out the right quantity of the right finished product, at the right time. This means that all needed ingredients and packaging material are available on time. This operational aspect can be improved.
Consequence: Production and Financial burden: some ingredients or materials are out of stock, some others are purchased in too large (or too small) quantity because there is no economic re-ordering quantity calculated.
Suggestion for improvement: A stock management system has to be put in place. To this end following data and information are needed:

- List of all SKUs;
- Volume of sales (past 12 months) for all SKUs
- Bill of material of all SKUs (ideally with code n° to consolidate common components)
- Purchasing price of each component
- Bill of ingredients (recipe) for each category of finished product
- Volume of sales (past 12 months) for each category of finished product
- Purchasing price of each primary ingredient
- Rolling production forecast (12 months)

Follow-up required: The data and information should be provided by **Mr. Patrick Buchanan**. Once they are obtained, a full stock management plan will be drafted and submitted to Canco.

2. Maintenance

Shortcoming: There is no workshop dedicated to maintenance of equipment. Maintenance is limited to simple operations such as routine technical checks, lubrication, replacement of belts, etc. There is no preventive maintenance schedule and no spare parts in inventory.
Consequence: The equipment is poorly maintained, the availability ratio must be low, yearly cost of maintenance for main equipment is not known. An equipment breakdown can be fixed rapidly only if the spare part is available in Kingston area: The situation is not managed but endured.
Suggestion for improvement: A proper workshop dedicated to maintenance operations must be created. The workshop must be closed, windows protected and door locked to prevent foreign intrusion. A complete set of tools, wrenches, benches, vices, thermal sensor, vibration sensor, etc. allowing first level mechanical and electrical interventions must be acquired.
Mr. Denis Mc Indoe, who is in charge of maintenance, should list all main equipment (i.e. equipments which when out of order prevent the production to progress) that is to say, boiler, cooker, seamer, etc. And record the following information:
Type, model, serial n°, date and country of manufacturing, name of the manufacturer.
Once corresponding data are gathered, the manufacturer (or closest authorized retail agent) will be contacted in order to obtain the list of recommended spare parts constituting the "first aid kit" that is to say the list of all wearable parts with the recommended replacement frequency calculated in work/hours. The recommendation of the manufacturer will be benchmarked against the maintenance experience accumulated by the maintenance specialist.
The key spare parts (spare parts which are not freely available in Kingston, which have a short life span, and which unavailability might cause a severe loss of revenue due to production stoppage), will have to be acquired. If the cost of brand new spare parts is too high, the possibility of acquiring standard replacement part or second hand parts will be investigated.
The proper training of the maintenance team is another key issue.

Recommendation: It is recommended that **Mr. Alwyn Lynch** from Ebony Park who is a skilled electromechanical engineer is contracted to assist in the field of:

1. Implementing a workshop with needed tools
2. Organizing the workshop (mainly 5S)
3. Assisting in the prioritized listing of the main spare parts to keep in inventory
4. Drafting a preventive maintenance schedule

PART C – COST OF GOODS

No action undertaken during the December 2009 mission.

PART D – FOLLOW UP MISSION (2010)

No individual action needed excepted a possible maintenance intervention of **Mr. Alwyn Lynch.**
For the ackee intake, fundamental research is needed and a separate proposal has been written. Please refer to the attached **Concept paper for improving the knowledge of the ackee fruit.**

Profile of enterprise 6. Livy's Food Ltd.

Address: Lot # 10, Yallah Industrial Estate, Pourman's corner, Yallah, St Thomas
Telephone: 876 395 46 66
Owner: Mr. Mohamed Islam (since early 2009)

Livy's is a medium size enterprise created in 2004. Three SKUs are produced

A. Bread fruit baked and frozen in vacuum plastic bags (80% of sales volume)
B. Sweet potato baked and frozen in vacuum plastic bags (5% of sales volume)
C. Tamarind rolls mixed with sugar in sealed plastic bags (15% of sales volume)

PART A – TECHNOLOGICAL REPORT

Livy's implemented the recommendations of the previous mission and does not require new technological advice for their current operations.

Livy's continues to expand and Mr. Islam is now in the process of installing a new/secondhand filling line for fruit juices and for ackee, packed is metal cans. The equipment was not yet in operation during the mission of December 2009, but was expected to be commissioned before the end of the year. The following is based on information supplied by the factory operator.

1. Product: Canned Fruit Juice

Process step: Preheating and pasteurization.
Shortcoming: The pre-heated juice is sent through a cooler before cans are seamed. After sealing the cans are pasteurized in the retort.
Consequence: unnecessary use of steam and fuel, extended production process
Suggestion for improvement: Pre-heat the juice, with a pH lower than 3.8, to 180°F and seal the container at minimum 180°F. Cool down immediately after filling/sealing and the pasteurization step in the retort can be eliminated.
Outcome: Reduced cost of fuel, shorter production cycle and increased level of productivity.
Investment cost: none
Follow-up required:
1. Most probably the can will have to be pre-heated before the filling of the juice in order to avoid the appearance of too high a negative pressure (vacuum) after cooling. Some lab trials are needed to support this modification.
2. It is absolutely necessary to measure the temperature/time diagram in the can AFTER filling occurs. This can only be done using a temperature sensor.

Packaging: Tin cans
Shortcoming: Packaging costs are extremely high and constitute 50% of production cost. (24 cans cost 700 Jam$ or 8.25 US$). This high can price is suffered by all food processors in Jamaica. Only one supplier (Crown Cork–Metal box) is active on the Jamaican market and enjoys a full monopoly. This supply problem must be addressed. It creates a big handicap for can contained Jamaican products (domestic sales or exports).
Suggestion for improvement:
1. The situation might probably be challenged if a critical mass of processors could join forces (group purchasing) to order a minimum quantity of cans abroad (20 feet container?)
2. Another alternative would be to explore the possibility of using plastic containers with aluminum pop up lids (but production of plastic containers must be local). This kind of packaging can be hand or machine sealed and the finished product can be sterilized.
Outcome: Less costly packaging.
Investment cost: None for group purchasing, to be determined for substituting plastic containers to existing cans (trials are mandatory).

2. Product: Ackee

Process step: Retorting

Shortcoming: Retorting process is not yet established.

Consequence: It is likely that existing retort conditions lead to an 'over kill' in F-o value, (as is the case with the other enterprises tested). This leads to an unnecessary use of steam and fuel, extended production process and loss of quality.

Suggestion for improvement: Purchase a sensor for temperature reading in cans and repeatedly collect heating data in product during retorting process. The help of a competent body (**SRC**) might be of good value to establish a standard operating procedure optimizing the temperature / time conditions preserving ackee quality and food safety.

Outcome: Reduced cost of fuel, shorter production cycle, better productivity and better quality of the end product.

Investment cost: Sensor for temperature reading and software needed: US$1.500.

Follow-up required: Livy's foods needs further support in order to optimize the retort conditions.

3. Boiler:

It has been noticed that the boiler was not operating at its nominal pressure (150 PSI) but was limited at 100 PSI. This downgraded regime was recommended by a safety consultant on the ground of safety considerations (?) It is advised to operate the boiler at its nominal pressure (150 PSI) to avoid unnecessary energy losses (circa 30%). The decennial hydraulic inspection to which any kind of pressurized equipment has to comply with, is more than sufficient to guarantee the full safety of the boiler under normal conditions of use.

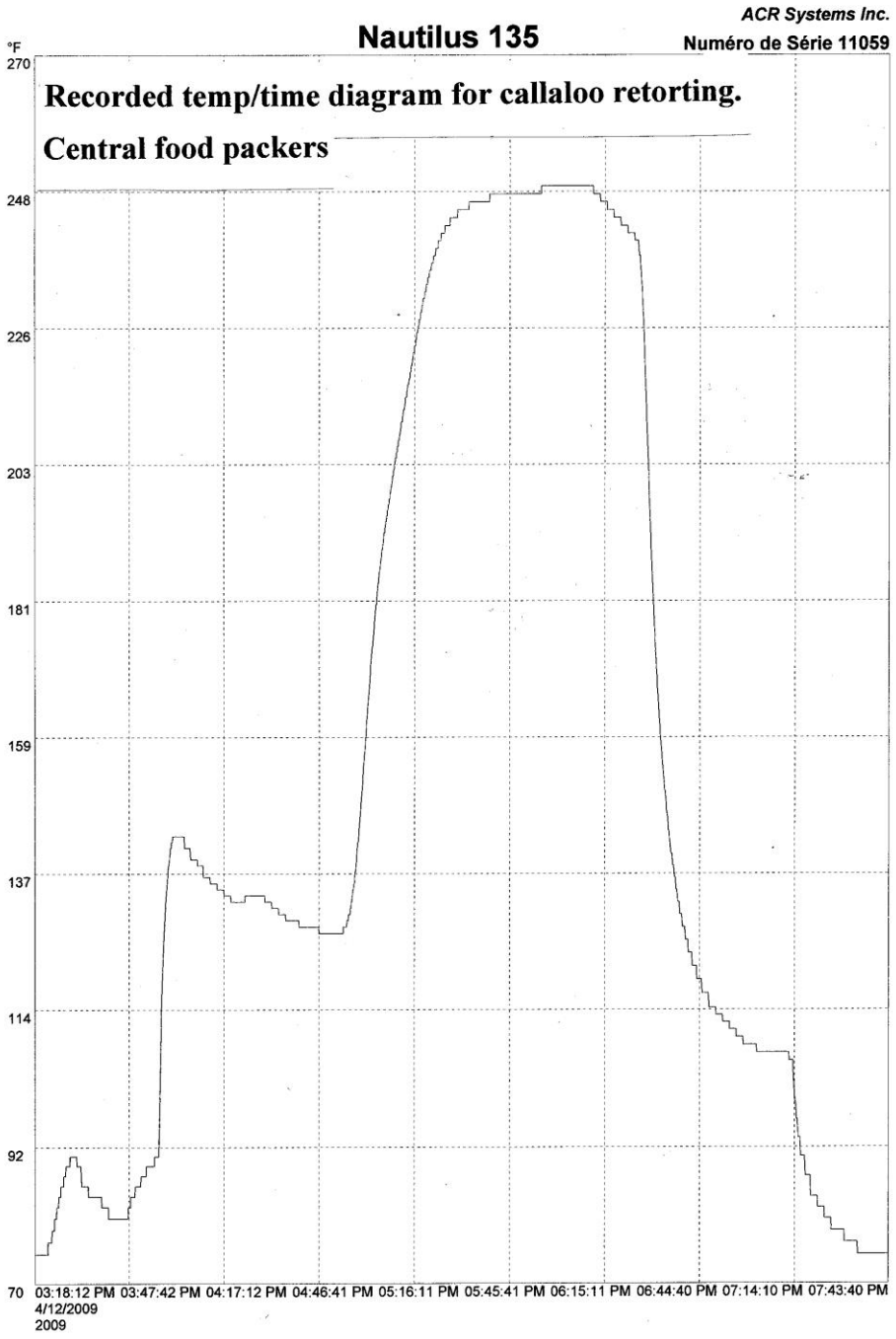
PART B – COST OF GOODS

No action undertaken during the December 2009 mission.

PART C – FOLLOW UP MISSION (2010)

Excepted retort, no individual action is needed for this company.

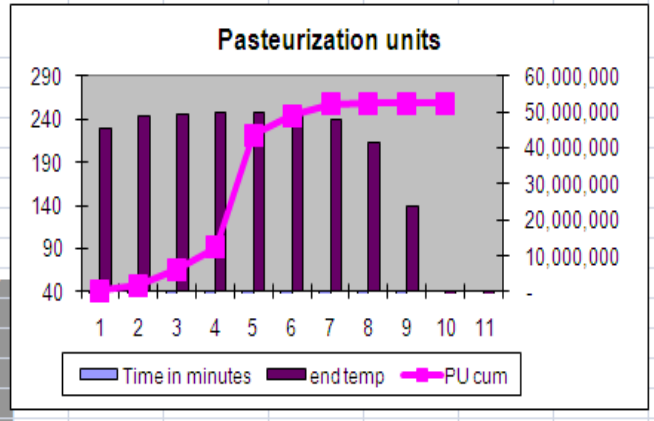
ANNEX 1

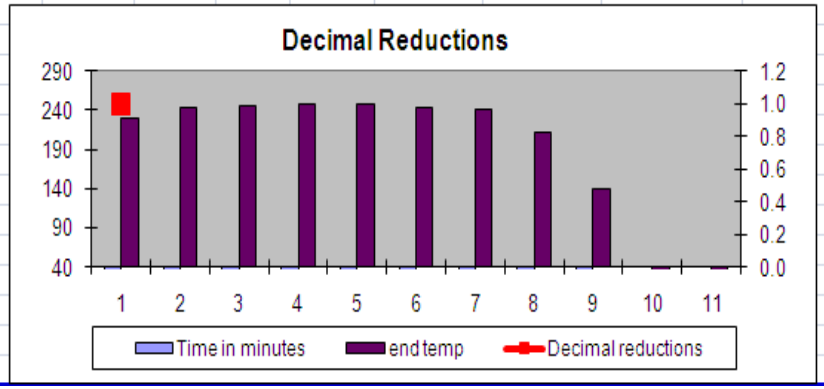

ACR Systems Inc.
Nautilus 135
Numéro de Série 11059
Recorded temp/time diagram for callaloo retorting.
Central food packers
°F
270
248
226
203
181
159
137
114
92
70
03:18:12 PM 03:47:42 PM 04:17:12 PM 04:46:41 PM 05:16:11 PM 05:45:41 PM 06:15:11 PM 06:44:40 PM 07:14:10 PM 07:43:40 PM
4/12/2009
2009

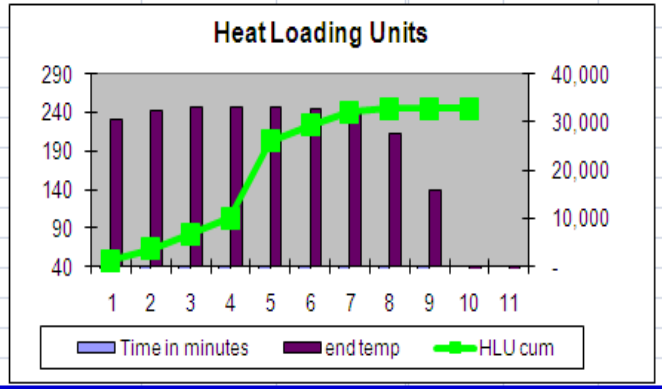
ANNEX 2

Jam Central food packer-callaloo4-12-09							Stumbo 1973	D temperature	250	degrees Far
								D time	0.2	minutes
								Z value	18	degrees Far

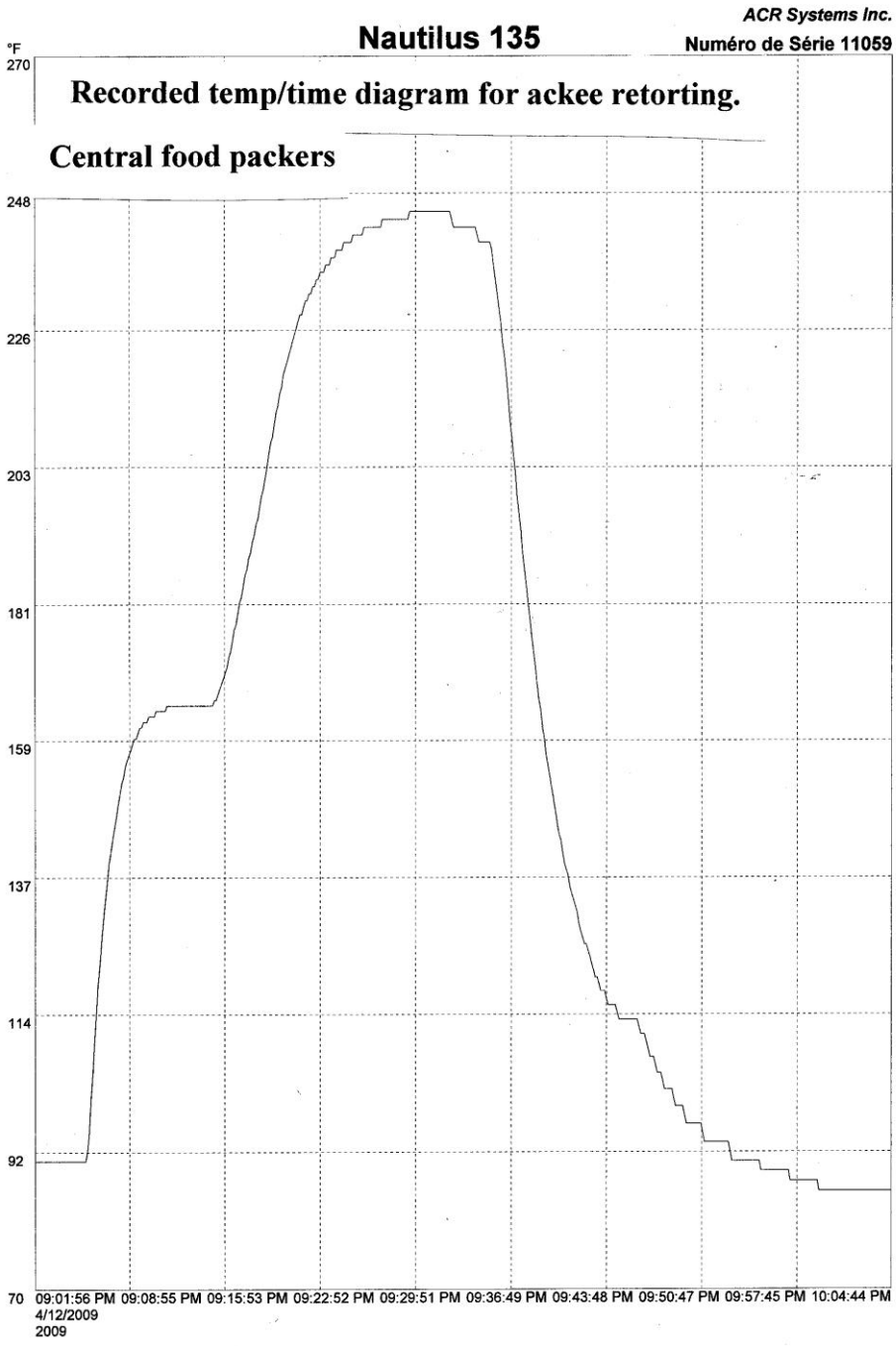
Period	Time in minutes	start temp	end temp	average temp	HLU	HLU cum	PU	PU cum	D Value	Decimal reductions	Fo
1	7	212	230	221	1,267	1,267	221,359	221,359	8.2	0.8570	0.171390572
2	7	230	243	236.5	2,302	3,569	1,607,715	1,829,075	1.1	6.2240	1.244795587
3	7	243	246	244.5	3,132	6,701	4,473,563	6,302,638	0.4	17.3186	3.463717665
4	7	246	248	247	3,449	10,150	6,159,458	12,462,096	0.3	23.8452	4.769044483
5	31	248	248	248	15,872	26,022	31,000,000	43,462,096	0.3	120.0109	24.00217416
6	7	248	244	246	3,318	29,340	5,419,846	48,881,942	0.3	20.9819	4.196389752
7	7	244	240	242	2,845	32,184	3,249,112	52,131,054	0.6	12.5783	2.515669565
8	3	240	212	226	658	32,843	179,845	52,310,899	4.3	0.6962	0.139247665
9	1	212	140	176	32	32,875	100	52,310,999	2583.1	0.0004	7.74264E-05
10		140	0	70	-	32,875	-	52,310,999	2000000000.0	0.0000	0
11			0		-		-				
			0		-		-				
Total	77				32,875		52,310,999			202.5	40.50
TARGETS					< 600		< 20 000			10_12	







ANNEX 3


ACR Systems Inc.
Nautilus 135
Numéro de Série 11059
°F
270
Recorded temp/time diagram for ackee retorting.
Central food packers
248
226
203
181
159
137
114
92
70
09:01:56 PM 09:08:55 PM 09:15:53 PM 09:22:52 PM 09:29:51 PM 09:36:49 PM 09:43:48 PM 09:50:47 PM 09:57:45 PM 10:04:44 PM
4/12/2009
2009

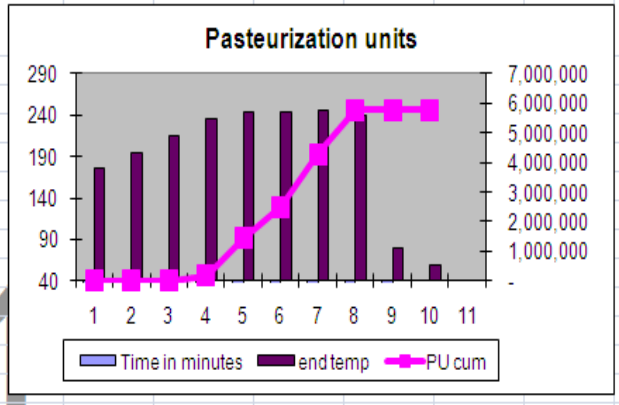
ANNEX 4

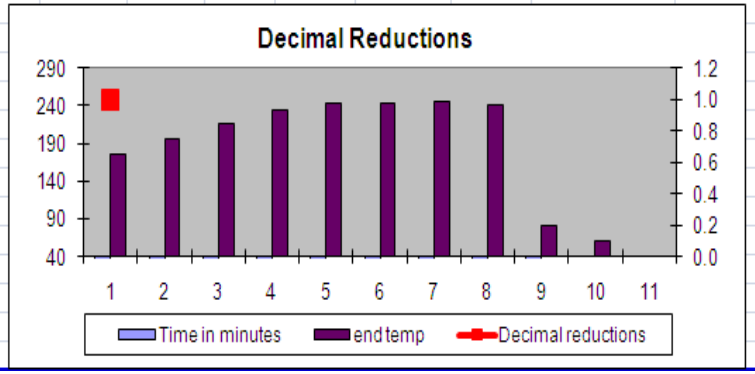
Jam CFP-ackee 7-12-09

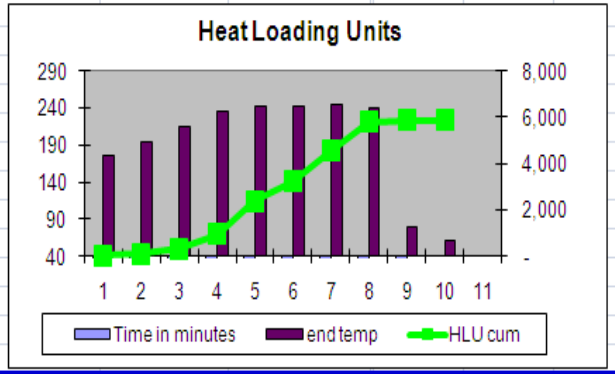
Stumbo 1973

D temperature	250	degrees Farenheit
D time	0.2	minutes
Z value	18	degrees Farenheit

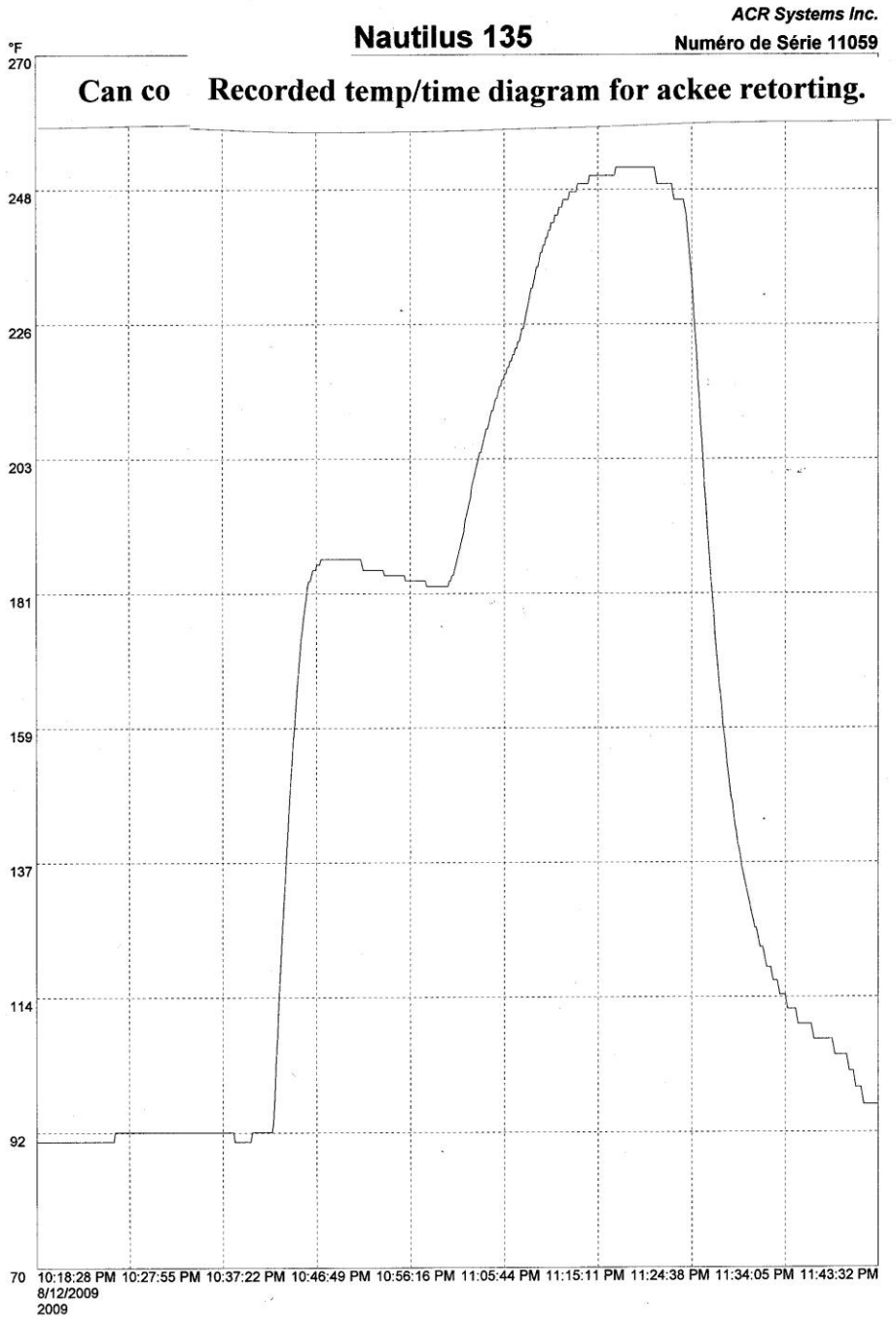
Period	Time in minutes	start temp	end temp	average temp	HLU	HLU cum	PU	PU cum	D Value	Decimal reductions	Fo
1	1	165	175	170	25	25	46	46	5565.1	0.0002	3.59381E-05
2	2	175	195	185	91	116	632	679	816.8	0.0024	0.000489687
3	2	195	215	205	196	311	8,168	8,847	63.2	0.0316	0.006324555
4	3	215	235	225	633	945	158,250	167,097	4.9	0.6126	0.12252716
5	4	235	243	239	1,448	2,393	1,264,911	1,432,008	0.8	4.8969	0.979374699
6	2	243	243	243	845	3,238	1,054,999	2,487,008	0.5	4.0842	0.816847731
7	3	243	245	244	1,317	4,554	1,798,453	4,285,460	0.4	6.9624	1.39247665
8	3	245	240	242.5	1,243	5,797	1,484,450	5,769,911	0.5	5.7468	1.149356055
9	4	240	80	160	69	5,866	52	5,769,963	20000.0	0.0002	0.00004
10		165	60	112.5	-	5,866	-	5,769,963	8708009.3	0.0000	0
11					-		-				
					-		-				
Total	24				5,866		5,769,963			22.3	4.47
TARGETS					< 600		< 20 000			10_12	







ANNEX 5


ACR Systems Inc.
Nautilus 135
Numéro de Série 11059
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Can co Recorded temp/time diagram for ackee retorting.
10:18:28 PM 10:27:55 PM 10:37:22 PM 10:46:49 PM 10:56:16 PM 11:05:44 PM 11:15:11 PM 11:24:38 PM 11:34:05 PM 11:43:32 PM
8/12/2009
2009

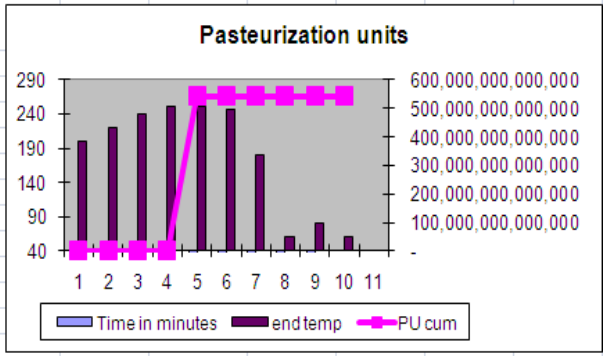
ANNEX 6

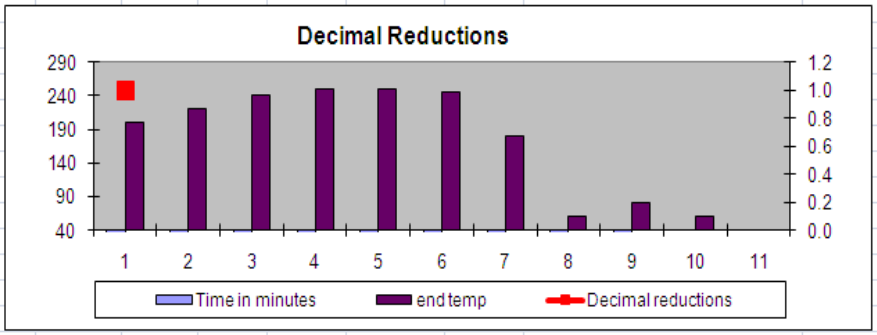
Jam Canco-ackee 7-12-09

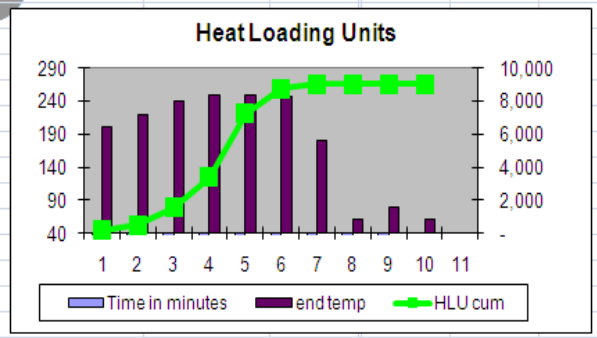
Stumbo 1973

D temperature	250	degrees Farenheit	
D time	0.2	minutes	
Z value	18	degrees Farenheit	

Period	Time in minutes	start temp	end temp	average temp	HLU	HLU cum	PU	PU cum	D Value	Decimal reductions	Fo
1	3	180	200	190	165	165	1,798	1,798	430.9	0.0070	0.001392
2	3	200	220	210	356	520	23,228	25,026	33.4	0.0899	0.017985
3	4	220	240	230	1,024	1,544	400,000	425,026	2.6	1.5485	0.309705
4	4	240	250	245	1,825	3,369	2,725,168	3,150,195	0.4	10.5500	2.109999
5	7	250	250	250	3,871	7,240	541,984,577,876,792	541,984,581,026,986	0.2	35.0000	7
6	3	250	246	248	1,536	8,776	3,000,000	541,984,584,026,986	0.3	11.6140	2.322791
7	2	246	180	213	266	9,042	22,729	541,984,584,049,715	22.7	0.0880	0.017598
8	0	180	60	120	-	9,042	-	541,984,584,049,715	3336201.1	0.0000	0
9	0	60	80	70	-	9,042	-	541,984,584,049,715	2000000000.0	0.0000	0
10		60	60	60	-	9,042	-	541,984,584,049,715	7187627327.6	0.0000	0
11					-		-				
					-		-				
Total	26				9,042		541,984,584,049,715			58.9	11.78
TARGETS					< 600		< 20 000			10_12	







ANNEX 7

Date: 17/01/2010

Energy source	Cost J$ per unit	KWH per unit	J$/KWH	Cos Fi	J$/KWH corrected	Operating & depreciation	%-age of cost saving
Public	27	1	27	0.8	33.8	NA	Reference
Diesel	92	4	23	0.9	25.6	4	13%
LPG	56.3	1.5	37.5	0.9	41.7	5	negative
Solar	344	30.8	11.2	1	11.2	Zero	67%