Skeldon steam plant

Submission on Factories to the Guyana Sugar Corporation Commission of Inquiry

OCTOBER 2015

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COMMISSIONERS

FACTORIES

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FACTORIES

1 INTRODUCTION

1.1 GuySuCo within recent years survived on bailouts by the Government Of Guyana (G.O.G), loans from Banks and other types of borrowings, so much so that it is currently carrying a heavy debt burden and has been unable, as far back as 2009, to provide sufficient Capital and Routine funding to enable the industry to sustain itself. Substandard management performance indicated in Field and Factories is of major concern.

1.2 As a consequence, the G.O.G. established a Commission Of Inquiry (C.O.I.) to chart the way forward to return the Industry to profitability.

1.3. The Factories team comprised Messrs. Joseph Alfred (Mechanical Engineer), George James (Process Technologist) and John Dow (Electrical Engineer & Projects), all with many years of experience in the management of GuySuCo factories and whose highest levels of Management in GuySuCo were Regional Director, Demerara (Joseph Alfred); Chief Process Technologist (George James) and Projects Director (John Dow). Members of the Team also saw service overseas in factories and sugar estates in Caricom countries (Jamaica, St. Kitts, Barbados) and Africa (Zambia).

2 EXECUTIVE SUMMARY

2.1 It is the view of the commissioners dealing with the factory operations, that the sugar industry must remain in operation, in whole or in part. Turnaround to profitability is not possible, in the short or medium term, due to the constraints facing the Industry at the present time. Given the decision to privatise, management must have a free hand to attract the massive injections of cash so badly needed to sustain and improve operational capability of the factories.

2.2 For some time now, the West Demerara Estates (Wales (GV) & Uitvlugt(ICBU)) have performed poorly with declining production and unit costs of production amongst the highest in the industry (***see Appendix Fac Ops 1***). Neither GV nor ICBU can stand alone for want of a sufficient supply of canes (***see Appendix Fac Ops 2 for out-of-cane hours***). Current field projections will reveal that, in 2016, GV and ICBU will only be able to operate for 20 and 17 weeks per annum respectively, when the norm is at least 30 weeks. However, given the recent interest, at both GV and ICBU, of existing cane farmers to expand their holdings and of others to get into cane farming, the screening process should be accelerated to vet these applications. Should a sustained increase in cane supply not result from these proposals, the two estates should be rationalised and a study commenced to enquire the feasibility and make recommendations for the transfer of canes between the estates, which time does not permit during the life of this C.O.I.

2.3 The advent of mechanisation in harvesting operations in the Industry has brought with it an increased amount of extraneous matter, field soil in particular. Peter Rein in "Cane Sugar Engineering" states ***"Excessive soil in cane increases the cost of maintenance, leads to increased loss of sugar, reduces the capacity of the mill and the output of the boilers and leads to higher usage of supplementary fuels",*** the effects of which are currently being felt

throughout GuySuCo's factories. Mechanisation must continue in order to cope with the dwindling supply of manual cane cutters. Steps are already in train to pay more careful attention to field conversion and tighter supervision in field to limit the ingress of mud, trash and tops into the factories. While the factories have installed rudimentary cane washing on feeder tables and/or cane carriers, the effort is far from enough to cope with the problem. Whilst Cane Washing (laundering) has been suggested as a possible solution for the removal of mud, it is not recommended due to the very high costs and major structural adjustments to the front-end of the factories which will have to be incurred to establish these plants. **In any case, studies abound which establish that the preferred solution is leaving the soil in the cane fields**. After exhaustive studies by Peter Rein *et al* throughout the Industry, Rein concluded in his "Cane Sugar Engineering" as follows: "*removal of soil, separated by whatever means, is a costly operation, with no benefits. It all has to be loaded and transported to suitable solids dump sites.* ***There is no doubt that there are tremendous benefits in leaving the soil in the cane fields".***

2.4 Pinhole grates installed in the Boilers at Skeldon and Albion are not suitable to handle bagasse with sand and ash content in excess of 3% as a result of the excessive field soil (mud) in the bagasse due to mechanical loading and/or harvesting. Our recommended solution for this problem is to install CAD (Continuous Ash Discharge) stokers which continuously remove the ash from the grate such that the boiler design operating conditions can be continuously maintained. The CAD stokers are superior to Dump Grates as dumping causes fluctuations in evaporation, steam pressure and temperature which are undesirable in power generation mode, such as required at Skeldon. A ballpark cost ex factory of conversion of one of the boilers at Skeldon from Pin Hole Grates to CAD stokers is US$1,150,000. A John Thompson Case Study of conversion to CAD stokers of boilers in Tanzania to overcome problems due to large quantities of field soil being brought in with the cane is attached (**see Appendix Fac Ops 3).**

2.5 It is recommended that the sale of the Steam & Power plant at Skeldon to Skeldon Energy Inc. (S.E.I.) be reversed. **The Power Purchase Agreement (PPA) between GuySuCo and the Guyana Power & Light (GPL) needs to be urgently renegotiated as the 4 US cents/KWH (kilowatt Hour) for power generated by the Turbo Alternators is considered to be much too low. The 2 US cents/ KWH for power generated by the Wartsila engines is also considered to be low, notwithstanding the fact that the HFO fuel for these engines is supplied free of cost by GPL.**

2.6 An improved emphasis is required for the Planned Maintenance system, if it is to contribute significantly to the lifting of equipment maintenance standards and procurement. Routine Non Destructive Testing should be the norm.

2.7 It is recommended to retain Skeldon factory and make it reliable by remedying the faults and narrowing the mismatch between field and factory.

2.8 Since there is a ready market in Caricom for refined sugar, it is recommended that the feasibility study for a sugar refinery at Skeldon be updated.

2.9 The production of Ethanol is not recommended.

2.10 In order to attain further added value, the sale of Molasses (a by-product) as a health food is recommended - a suitable brand name should be registered.

2.11 It is recommended that the staffing of Factory Operations Head Office be strengthened by addition of a number of specialists to the present team. It is also recommended that the position of Technical Director as Head of this Department be reestablished.

3 METHODOLOGY

3.1 **Estate visits**. All 7 factories were visited during the Off-Crop period to observe maintenance practices. Subsequent visits were made to individual factories and the Demerara Sugar Terminals during the In-Crop grinding period of the 2nd Crop, 2015 to observe day-to-day operations. In consideration of the close relationship desired between Factory and Agriculture Departments in the Cane Sugar industry, the majority of visits were done jointly with the Agriculture team (Dr. Harold Davis and Mr. John Piggott). The Factory team participated in the Field visits, and, conversely, the Agriculture team participated in the Factory Visits.

Initial meetings were held at each location with the Estate Managers and their Departmental Heads - the main purpose of these interactions was to obtain a good overview of the Strengths, Weaknesses, Opportunities and Threats on each Estate from the viewpoint of the Managers on location. After these meetings, visits were made to either field or factory. Managers were, in the main, very frank and open in expressing their opinions and views (***see Appendix Fac Ops 4 for details of visits)***..

3.2 **Previous studies**. Statistics and production records were obtained from the vast amount of available data from GuySuCo and previous studies done on the local sugar industry. Business Plans and Strategic Plans for various periods were examined. The following persons offered valuable advice:

- Mr. Josh Ragnauth, former Factory Operations Manager of GuySuCo, who examined data and offered timely advice on existing operating shortcomings of factories and gave valuable advice on the way forward in processing.

- Mr. Peter McIntyre, Consultant Engineering & Sales, Industrial Watertube Boiler Business Unit, John Thompson, with regards to Boiler problems in the handling of high ash in bagasse.

4 GENERAL OBSERVATIONS

In our considered opinion, the major problems facing GuySuCo's factories at present are as follows:

4.1 **Extraneous matter.** This is comprised mainly of Field Soil, Trash and Tops. None of the factories was designed for the levels of extraneous matter being experienced at present. All Estates now have Bell Loaders, with two Estates (Skeldon & East Demerara) also having Chopstick Cane Harvesters (8 at Skeldon, 2 at East Demerara). These machines bring copious amounts of field soil, tops and trash into the factories. The extraneous matter creates operational problems in the following areas:

a) **Clarification.** The clay soils tend to stay in suspension such that the clarified juice does not settle at the desired rate. Factories have tried a cocktail of flocculants to increase settling rates with limited effect - grinding rates either have to be reduced to allow more time for settling or the factory has to stop grinding for sufficient time to allow settling to occur - failure to do so results in carryover of dirty juice to the evaporators - the end result is increased scaling of the evaporator tubes and poor sugar quality.

b) **Steam Generation.** The older boilers, such as the John Thompson (JT) boilers at Rose Hall and Uitvlugt, cannot cope successfully with high levels of field soil entering the factory with the cane. Factory time is lost due to low steam as the JT boiler furnaces have to be cleaned of ash much more frequently than would be the case if clean cane was being milled (the furnaces are cleaned manually by raking the ash from the furnace floor). These boilers, most in excess of 50 years old, were designed for pile-burning of coarse bagasse from the milling of clean, hand-cut cane. Over the years "top-hats" were introduced in the furnaces to allow burning of the finer bagasse which was produced by better preparation (knifing) of the cane - it was difficult for air to penetrate the piles of finer bagasse - the "top hats" introduced a source of air at the bottom of the piles to improve burning. Note that the improved preparation of cane was necessary to increase extraction at the Milling plant, with less sucrose lost in the bagasse.

High levels of field soil in cane entering the factories also results in reduced throughput due to mill slippages, increased roller wear, increased boiler tube wear (due to erosion) and increased usage of Heavy Fuel Oil (HFO) at Skeldon and wood and/or diesel at the other factories.

c) **Boiling House**. Excessive levels of tops and trash are evident in the cane entering the factories - this produces increased colour in the sugar and reduced recoveries in the boiling house due to high viscosities which prevent brixing of the "C" massecuite to the required levels - high molasses purities, with consequent sucrose loss, and high TC/TS (Tonnes cane per Tonne sugar) are the inevitable result. The tops and trash also increase the volume of bagasse exiting the mills, causing more sucrose to be lost in bagasse going to the boilers. During visits to the fields whilst harvesting was in progress, it was evident that there is room for improvement in the standards of cane cutting, as poor topping and lots of trash in the cut cane were visible. Evidence of the high level of tops and trash was also observed in the cane in punts entering the factories.

The exhaustibility of the final molasses, a by-product of value, is one of the most important criteria in determining the eventual quantum of sucrose recovered from the sugar cane. The final molasses purity will be improved if reductions in the extraneous matter can be achieved. In order to judge the exhaustibility of final molasses, the determination of the RS/A (reducing sugar to ash ratio) must be carried out, as this gives an accurate indication of the efficiency with which the molasses has been exhausted. It is recommended that this important routine analysis, which is no longer done in the factory laboratories, be resuscitated with immediate effect.

4.2 **Sugar Quality.** The industry in its present state produces raw sugar for the local and export markets. GuySuCo's 7 factories produce raws as commercial sugar as follows:

Skeldon.....Bulk only.
Albion.....Bulk only.
Rose Hall.....Bulk + 50 Kg bags for local direct consumption.
Blairmont.....Bulk + 50 Kg bags + packaged sugar for local consumption and export.
Enmore.....Bulk + 50 Kg bags + packaged sugar for local consumption and export.
Wales.....Bulk only.
Uitvlugt.....Bulk + 50 Kg bags for local direct consumption.

The standards required to be met by the various types of sugar are as shown in the Table below:

Table of Quality Standards specification

Quality Parameter	Unit	Bulk Raws	50 Kg local	Direct consumption (Packaged)
Polarisation	%	95.7 - 98.0	98.0 - 98.2	98.0 - 98.5
Moisture	%	0.35 - 0.6	0.25 - 0.4	0.15 - 0.4
Colour	ICUMSA	3000 - 6000	3500 - 4500	1500 - 3000
Insoluble solids	ppm	1500	800	≤ 500
Starch	ppm	150 - 250	150 - 250	150-180
Dextran	ppm	180-280	180-280	150-200
Ash	%	0.1 - 0.4	0.1 - 0.8	0.15

Only packaged sugar is ISO certified annually.

In the case of bulk raws the quality continues to vary below the specification and severe monetary penalties are occasionally meted out to the Corporation which impacts negatively on the revenues received. The unacceptable level of Dextran was directly related to the processing of stale cane, whilst starch, colour and ash were due to the delivery of a large percentage of trash and cane tops.

In 2014 penalties were incurred for shipments to the European Union. The premium was US$709,000 (equivalent to GYD145 Million) - however, penalties were GYD 14 Million, resulting in a reduced premium of GYD 131 Million.

4.3 **Burning to Grinding intervals (BGI).** Once it has been cut, cane is liable to deteriorate rapidly, especially in the case of billeted cane. The ideal BGI for chopper harvested (billeted) cane is less than 16 hours - this is hardly ever achieved at the Factories that receive chopstick cane (Skeldon and Enmore) - deterioration of cane billets is much more rapid, when compared to wholestalk cane, due to the number of cut ends which encourage increased microbial action. In 2014 only 25% of cane was delivered to the factories in less than 24 hours. Inversion of sucrose into fructose and glucose, occasioned by long delays in getting the canes to the factories, reduces the amount of recoverable sucrose from the cane.

4.4 **Factory operating hours**. One of the major problems is the inability of many of the factories to have reasonable weekly operating hours, due to heavy out-of-cane hours caused by poor attendance of manual cane harvesters, in particular. It becomes necessary to accumulate cane, often holding over cane from one day to the next - this practice causes increased BGI and the resultant loss of sugar. This stop-and-start operation results in further losses as clarifiers may have to be liquidated (if the stop is lengthy) and other losses occur in the process. The Crop may also have to be extended into the rainy season due to the increase in grinding weeks of the factory required to take off the canes. It should be noted that **long out-of-cane periods mask factory inefficiencies**, as repairs which would normally have incurred factory downtime are often done during out-of-cane periods. True factory time efficiency can only be established when the factory is fully supplied with cane.

4.5 **Staffing**. The visits to factories revealed that in many cases, senior staff were not sufficiently familiar with the operations of the factory equipment because of recent transfers, lack of knowledge or inexperience. Staff turnover is reportedly as high as 8% per annum. This high turnover results in a loss of continuity and impacts negatively on institutional memory in the factories.

5 REPORT ON FACTORIES

5.1 SKELDON

Design performance statistics v actual 2014. The stated objectives of the new Skeldon Factory were as follows in Columns 1 & 2 of the Table below - column 3 shows the actual achieved in year 2014:

Budgetted Performance Statistics		2014 Actual
Pol% Cane	11.80%	8.37%
Fibre% Cane	16.80%	19.42%
sugar production	116,000 ts/y	35,890 ts.
cane consumption	1,150,000 tc/y	590,180 tc.
cane processing rate	8,400 tc/d	4,318 tc/d
cane processing rate	350 tc/h	179.90 tc/d
time efficiency	92.00%	86.14%
pol extraction	97.00%	92.21%
boiling house recovery	88.10%	76.96%
overall recovery	85.50%	70.97%
sugar production	35.5 ts/h	10.94 ts/h
sugar quality	99.3 pol	n/a
colour	<1350 icumsa	n/a
moisture	<0.18%	n/a

5.1.1 **Training deficiency and major remedial issues**. The new Skeldon Factory can be considered a "**sea change**" for GuySuCo - a new modern factory with equipment quite unfamiliar to GuySuCo's factory employees. The failure of this factory to date, 6 years after commissioning, is a poor reflection on Booker-Tate (the project managers) and CNTIC (the Chinese Turn-Key contractor). Among the new equipment in this factory are the following:

- Aero-belts (air supported rubber conveyor belts).
- Shredder.
- Diffuser.
- Continuous vacuum pans.
- Continuous vertical crystalliser.
- High pressure boilers.
- Condensing turbine.

This new equipment should have necessitated specialist training and exposure to engineers and process personnel in the years prior to commissioning - this training, in our opinion, needed to be much more detailed, with a structured training programme for each individual including as much hands-on exposure as possible, instead of 4 to 5 weeks "observing operations" at Komati factory in South Africa as stated by one of the individuals who was "trained". Furthermore, individuals sent for training should have been monitored closely during the training period to ensure that they were receiving the full benefit from the training programme.

Further to this, there were numerous design flaws that have had to be corrected at high cost to GuySuCo - some of the defects that required correction by Bosch Projects of South Africa were as follows:

- Inadequate Bagasse scratcher
- Inadequate Bagasse Ploughing.
- Faulty Bagasse distribution.
- Inadequate condensate storage (additional condensate tank required).

Bosch were paid in excess of US$1.3 Million to correct these defects.

Major material and mechanical failures are allegedly the fault of the Chinese Turn-key contractor, CNTIC - to date, equipment which has had to be changed, in just 6 years of operation, include, but are not necessarily limited to the following:

- All hubs on the Heavy Duty knives were replaced.
- Over 100 defective valves were changed.
- Leaking pipes, from 2" diameter upwards, were replaced (ongoing) - piping replacements were needed to such an extent that, during the Off-Crop visit to Skeldon, piping was being removed from the old factory to aid in the replacement of defective piping in the new Factory.
- 41 pumps replaced on year 2014 Capital.
- 18 pumps, including 2(two) electrical Boiler feed pumps replaced previously.

The need to do such major repair work each Off-Crop as faults pop up during the Crop is equivalent to factory staff having to be "fire fighting" all the time to correct defects - the inevitable result is routine planned Off-Crop work being sacrificed as manpower has to be diverted to these jobs.

5.1.2 **Incomplete commissioning and handover**. The Handover of the new factory was incomplete since too many operating faults emerged soon after commissioning - indeed, to date some of the equipment is still not commissioned (e.g. the sugar dryer). One comes to the conclusion that the factory should not have been taken over by GuySuCo when so many defects were apparent. The appointment of Booker-Tate, in 2000, to be Project Managers for the Factory, at the same time that Booker-Tate were managing GuySuCo, may have been a conflict of interest as stated by a former Chairman of GuySuCo who alleged that project problems were not brought to the attention of the Board at the time that they should have been.

5.1.3 **Initial sub-standard quality Boiler Feed water**. High pressure boilers, such as those at Skeldon, require water of the highest quality - whilst pure condensate is normally available when the factory is in operation, a source of good make-up water is necessary. The make-up water at Skeldon was planned to be provided from artesian well water treated to potable condition and then softened using demineralization technology.

The drilling of an artesian well on the Factory Site was contracted out. **G$52 Million was spent in a failed effort to establish this well**, after drilling at two sites in close proximity to one another failed, reportedly due to the drill mud disappearing into an underground void. No further attempt was made to establish a well on site after these two failures.

The factory should not have been commissioned without a source of good make-up water. Canal water, either raw, or passed through the treatment plant that was not designed to treat such poor quality water, was reportedly the only source of make-up water during the first 2 years of operation of the factory - the inevitable result of using this water was major internal scaling of the boiler tubes. Chemical cleaning to remove the build-up of scale from the tubes became necessary. CNTIC did a successful cleaning of #2 Boiler. The cleaning of #1 boiler was left to be done by local staff - ***this cleaning exercise was botched***, resulting in the melting down of the entire superheater bank of the boiler - **partial retubing of the boiler, at a reported cost of US$2.3 Million**, was done with assistance of the Chinese.

Deposits of scale on the blades of the turbines also resulted due to the use of this impure make-up water source, necessitating the removal of this scale, once again at GuySuCo's expense (G$9,767,707).

Make- up water quality has improved from 2013 as Artesian well water from Guyana Water Inc. has become available and feeds the factory demineralisation plant which provides the make-up water to the boiler plant. Skeldon supplies free electrical power to the well in return for the use of GWI’s artesian well water.

5.1.4 **Clarifier muds recycling.** The decision of the Project Managers to recycle the Clarifier

muds to the Diffuser, instead of including a Filtration station in the design of the Factory, is considered to be a major blunder, as the high level of extraneous matter resulting from mechanical loading and mechanical harvesting in a country with high rainfall and poorly draining heavy clay soils seems not to have been considered. The return of the clarifier muds to the Diffuser resulted in a further increase in ash in bagasse (estimated to be in excess of 10%) with increased erosion of the boiler tubes and pinhole grate problems being the end result. GuySuCo have had to abandon this practice of mud recycling. The small Rotary vacuum Filter from the old Skeldon factory has been installed in the new Factory and a large 30' x 20' Rotary Vacuum Filter has been ordered from India to complement the small filter. It is expected that further costly modifications will be necessary to the rubber belt bagasse conveying system to produce sufficient bagacillo for these filters.

5.1.5 **Under-rated Punt Dumper and associated major mechanical failures**. One of the major constraints to the Skeldon factory has been the inability to feed sufficient cane into the factory due to the repeated failure of the "new design" punt dumpers which were supplied by Honiron - it is reported that, during performance tests the two punt dumpers were only capable of 299 tonnes cane per hour (tch) instead of the expected capacity of 350 tch. This was followed by repeated failures of the steel supporting structure which necessitated upgrading the steel supports and other works. GuySuCo, prior to the 1st Crop 2015, replaced the Outboard Punt Dumper, the more problematic of the two dumpers, with a winch type Punt Dumper at a cost of approximately US$1 million. This Punt Dumper, when installed, was found to be discharging the cane from the punts before the dumper reached the cane scale - GuySuCo, in order to make the Punt Dumper functional, lowered the Cane Scale as much as possible - this was still not enough - a portion of the northern side of the scale bin had to be cut off to allow the cane to enter the bin. This reduction, however, results in increased droppings when billeted cane is discharged from the punts - the canal below the Punt Dumper has to be cleaned of dropped cane more often than should be necessary (this cleaning takes about 45 minutes) and therefore reduces the amount of cane that can be fed into the factory during these cleaning times.

Further investigation of the Punt Dumper installation is required. Some of the questions that perhaps need to be answered by the Project Managers and others are:

- Knowing the importance of achieving the rated hourly cane input into the factory, what guarantees were written into the Honiron Contract to ensure the achievement of 350 tch?
- Why was the original installation accepted when performance trials showed that only 299 tch was achieved?.
- Was the minimum average punt weight correctly specified in the contract?
- Was adequate structural analysis done of the supporting steel structures to ensure that failure would not occur during instances of punts falling out of the cradle?
- Were the experiences of the punt dumper operation in GuySuCo factories fed to the suppliers in order to ensure that the steel supporting structure would be able to withstand all foreseeable incidents that could lead to failure?
- Why was the new winch-type punt dumper installation prior to the 1st crop 2015 accepted when the punt dumper was tilting at a level substantially lower than it

should in order to discharge cane into the existing cane scale?

- Was the correct information with regards to the height of the cane scale relative to factory ground floor level or any other relevant datum point given to the South African supplier of the winch-type punt dumper?

5.1.6 **Boiler retubing**. Factory Operations staff have advised that the present condition of the tubes of #2 Boiler (some failures are already occurring) indicates that complete retubing of the #2 boiler will be necessary in approximately 2 years. Factory Operations has estimated, based on the actual cost of partial retubing of #1 Boiler, that this complete retubing is likely to cost approximately US$4 Million. It is recommended, however, that, prior to undertaking this expenditure, an internal Non-Destructive Testing of the boiler tubes be undertaken by a Company that specialises in IRIS (Internal Rotating Inspection System) testing on a regular basis. SteelTest of South Africa is one such Company that can bid to do this job (**see Appendix Fac Ops 5**). This NDT examination will determine whether complete or partial retubing of the boiler is necessary. The interior surface of the tubes must be cleaned of all scale prior to this examination. The budget cost of the IRIS examination, excluding local costs, is approximately US$ 12,000.

5.1.7 **Potential gearbox failure**. The 5-stage Planetary Gearbox (manufactured by EICKHOFF of Germany), that drives the Diffuser, was reportedly making an unusual sound when in operation. During the In-Crop visit to Skeldon on 27th and 28th August, 2015 the factories team were able to confirm this observation by Skeldon factory staff. However, two sounds, in quick succession, were emanating form the Gearbox this crop compared with a single sound in previous crops. It was reported that the Gearbox had started making this unusual sound during the 1st Crop 2014. Furthermore, tests done on the Gearbox oil by MACORP in July 2014 revealed the presence of wear metals, with the Fe (iron) content as high as 681 ppm. Examination of an Oil sample during the Team's visit confirmed the presence of metallic particles in the oil.

It must be stressed that, should this Gearbox suffer a premature failure, Skeldon Factory, and all reaping of both Estate and Farmers' cane, would come to a complete halt until such time as a replacement Gearbox, most likely not a "shelf" item, could be received from the Manufacturer in Germany and installed. It is therefore recommended that an urgent order be placed for a replacement gearbox, whilst funding the visit of an Engineer to offer an opinion on the nature of the problem, as requested by GuySuCo's Factory Operations staff since mid-year 2014 (not approved due to shortage of funds).

This Gearbox weighs 33,850 Kg, without the motor. Previous experience dictates that the long 2016 Mid-year Off-Crop period will be insufficient time to remove the faulty Gearbox, ship same to Germany, repair, and return to Guyana. Air Freight is an option, but will be very costly. Replacement with a new gearbox is judged to be the best option. The landed cost of a new gearbox, based on a recent quote obtained by GuySuCo, is approximately US$500,000. The supply ex factory of 7 to 8 months confirms the fact that this gearbox is not a shelf item.

5.1.8 **Major expenditure**. The Punt Dumpers, Shredder, treated water to the Boiler Plant, insufficient pure condensate (entrainment in #2 vessel), amongst others, were (and some still are) major issues which required attention. From the commencement there was a

mismatch between field and factory which did not augur well for continuous operations. This has resulted in expenditure, both Capital and Routine, far in excess of what one would expect for a new factory. The level of the expenses necessitated that the other factories be starved of both routine and capital expenditure.

5.1.9 **Excessive expenditure since commissioning**. The failure to date of the new Factory and the inability therefore for the factory to produce a reasonable R.O.I (Return On Investment) has been a tremendous drain on GuySuCo's finances. The amount of Capital that has been spent on this new factory, since commissioning in 2009, has caused the 6 older factories to be starved of Capital (see Table I below).

TABLE I

Capital expenditure on Factories for the period 2009 to June 2015

Year	Skeldon G$M	Albion G$M	Rose Hall G$M	Blairmont G$M	E.D.E. G$M	Wales G$M	Uitvlugt G$M
2009	90.16	21.5	42.54	136.38	33.24+ 11.37 L.B.I	46.75	45.1
2010	110.26	18.8	35.94	18.1	67.02	12.77	78.51
2011	62.71	10.05	33.17	21.99	243.72**	33.39	9.86
2012	162.41	1.99	0	22.28	7.35	20.94	1.94
2013	0	0.32	0	0	5.34	0	0
2014	343.53	121.3	17.88	12.2	43.67	3.71	8.03
2015*	1.45	0	0	0	0	0	0
Total =	**770.52**	**173.96**	**129.53**	**210.95**	**411.71**	**117.56**	**143.44**

***** GuySuCo has decided not to approve any capital expenditure in year 2015.
****** Relocation of Punt Dumper from L.B.I factory to E.H.P. factory following the closure of L.B.I.

In addition to the G$770.52 million Capital funds spent on the Skeldon factory to date since commissioning, substantive other funds have been spent on the factory and charged to routine expenditure (**see Appendix Fac Ops 6)**. Perusal of this Appendix indicates that some of the major items of expenditure were:

- Heavy Fuel Oil (HFO) purchases of **G$1.522 Billion** for the years 2009 to 2014
- Dieselene purchases of **G$ 309 Million** for the years 2009 to 2014.
- Transportation costs of **G$270 Million** for the years 2009,2010, 2011 and 2013.
- Payment to CNTIC of **G$152 Million** for technical support services in 2011.
- Purchase of Air Preheater tubes of **G$25 Million** for the years 2014 and 2015.

H**aving regard to the afore-mentioned, GuySuCo should seek some measure of redress from the Project Managers and/or the Turn-Key Contractor.**

5.1.10 **Co-generation at Skeldon.** High pressure and high efficiency boilers, similar to those installed at Skeldon factory in order to produce surplus electrical energy for sale to GPL, come at a price and they have efficient waste heat recovery equipment in the form of airheaters and economizers which result in greater maintenance costs. The treatment of boiler feedwater for use in these high pressure boilers is much more expensive than that needed for the lower pressure boilers installed in the other GuySuCo factories.

The "rationale" for this installation is the added-value to be derived from the export of surplus electrical power and the sale of such to GPL. To be profitable, much of this power should be derived from the steam turbines during the Crop. GuySuCo, in order to provide firm power year-round to GPL also supplies power from Wartsila sets which use HFO (Heavy Fuel Oil) and/or Dieselene – providing power from these Diesel Generators is not considered to be Co-generation as GPL could have done the same by installing its own Wartsila power station in the upper Corentyne. Although the agreement with GPL mandates that they supply HFO "free-issue" to GuySuCo for these Wartsila sets, these machines are expensive to maintain and the price paid of US 2 cents per Kilowatt Hour to GuySuCo, even considering the free issue of fuel, may not provide a fair return.

The power derived and exported from the Steam Sets during the period 2009 – 2015 is very low when compared with the power exported from the Diesel Sets. The Income earned from the Export sales is shown in Table II below:

TABLE II

INCOME EARNED FROM EXPORT POWER 2009 - 2015

	INCOME	
YEAR	**From HFO/Diesel Wartsila Sets (G$)**	**From Steam Sets (G$)**
2009	198,173,056	Nil
2010	457,560,247	Nil
2011	175,776,463	67,466,730
2012	109110,125	53,759,079
2013	184,163,794	57,747,157
2014	166,377,178	74,388,659
2015*	63,302,894	34,465,159
TOTAL =	**G$1,354,463,757**	**G$287,826,784**

* Year To Date (July, 2015).

This Income indicates that the income generated from the Steam Sets (i.e. from Bagasse) is only 17.52 % of the total income, whereas the income generated from the Diesel Sets (i.e. from HFO and/or Diesel) is 82.48 %. When one considers, however, that the export power generated from the Steam Sets fetches a price twice that generated from the Diesel Sets (US 4 cents compared to US 2 Cents) this indicates that the export power from the Steam Sets during the period 2009 to July, 2015 was only 9.6% of the total export power compared to 90.4% from the Diesel Sets. This percentage is very low.

Every effort must be made to maximize the bagasse generated export power during Crop. GuySuCo's explanation for this low bagasse generated power is as follows *"In the early years due to the problems with the Factory and inadequate cane supply the power supplied by steam was quite minimal. With improved cane supply in 2015 and fewer factory breakdowns we expect the proportion of bagasse generated power to rise".*

5.1.12 **Other factory concerns (Workshop etc.)** The workshop in the old factory is a safety and health hazard and does not meet the minimum standards required of a mechanical workshop. It is recommended that the new workshop, which has been budgetted for, but not approved to date, should be given priority for construction (**G$40 Million for mechanical workshop only**).

The lighting in the factory is poor. "In-house" improvements are on-going.

Sensitive equipment, such as the control panels for the centrifugals, which require an air-conditioned environment, are not adequately supplied. This is due to the failure of the air-conditioning units originally supplied as a part of the turn-key contract.

5.1.13 **Wharf sugar bin subsidence**. The sugar bin capacity at the Skeldon wharf was derated in 2001, from 1000 tons to 850 tons, following the failure of one of the Rendex steel piles which necessitated driving of a pipe steel pile close to the failed pile and establishing a connection betweenthe upper good section of the failed pile to the newly driven pile - this was possible as the failed pile was at the North-Eastern corner of the piled foundation and ready access for installation was available.

The pile failure was judged to be largely due to deterioration of the steel resulting from the non-functioning of the Cathodic Protection which was installed when the sugar bins were erected originally - this served to protect the steel piles from the salt water of the Corentyne river. Contact with the manufacturers of the cathodic protection, at that time, elicited the response that the unit was obsolete, spares were no longer available and a replacement was suggested. No replacement cathodic protection has been installed to date. The capacity of the sugar bins has been further derated to 650 tonnes. It is recommended that a replacement Cathodic Unit be ordered and installed as a matter of priority to prevent further deterioration of the Rendex piles. Regular checks and occasional replacement of the sacrificial anodes are necessary to ensure that the unit functions properly at all times. It must be stressed that failure to install this unit may result in ultimate failure of the piling supporting the sugar bins, particularly in view of the fact that occasional loading above the derated capacity has allegedly occurred from time to time.

It is suggested that the Cathodic Protection Units for these steel piles, those at the Wharf at the Demerara Sugar terminals and the steel sheet piling at Albion factory can be sourced at the same time.

5.1.11 **Inadequate drainage of Manarabisi**. In order to provide adequate drainage for Skeldon's cane expansion in Blocks 1,2, 3 and 4 of the Manarabisi area, two new Drainage Pump Stations were planned - the first, at No.74, with 2(two) 300 tpm diesel-

driven pumps, was installed and commissioned in 2001. The second drainage pump installation was planned for installation of a 180 tpm pump at No. 66 (at the Northern end of the Seaforth Canal). This would pump drainage water into the No. 66 creek which flows into the Corentyne River - it is understood, however, that the residents of that area objected to the siting of pumps at this location as they felt that their lands would be flooded during the high tides, although calculations had shown that the pumps would only increase the level in the creek by 2" whilst pumping. In view of these objections a decision was taken to construct the pump station on the Canje Creek close to the Manarabisi pump station, to pump into the Canje Creek rather than the Corentyne as originally planned - GuySuCo's financial difficulties reportedly prevented this installation at the time (i.e. soon after the No. 74 installation) and the National Drainage & Irrigation Authority (N.D.I.A.) eventually agreed to fund and construct the Pump Station and canal to link the Manarabisi drainage to the station. To date, however, although the pump station is substantially complete, there is no drainage as the canal to carry water to the pump is not complete and other works at the Pump station, such as building up the dam, are still to be done. The failure to provide adequate drainage for the Estate expansion in Blocks 1,2, 3 and 4 (Block 4 and a portion of Block 3 are still not cultivated).has resulted in the slow run-off of water when rain falls with all the adverse effects that this causes in a cane cultivation area - additional mud enters the factory with the mechanically harvested cane, damage to the fields, dams etc. It is recommended that the greatest urgency be given to the completion of the canal and other works necessary (by NDIA) to make the No. 66 drainage pump station functional.

5.2 ALBION

5.2.1 Albion Estate continues to perform satisfactorily with the lowest unit cost (**see Appendix Fac Ops 1**). With existing equipment, Albion is encouraged to strive to achieve 180 Tonnes Cane per hour when ideal conditions exist. Syrup brixes are lower than the normal target of 65 Brix expected, necessitating that the pans evaporate some water in single effect that should be evaporated in quadruple effect in the Evaporator station. It is recommended that flash recovery of the back pressure condensate to the 1st effect vapour and 1st vessel condensate to 2nd vapour be done - this will improve the evaporation rate.

5.2.2 The condition of the sheet piling under the pre-milling area is far from satisfactory with major erosion of piling and sub-soil leaching out from under the reinforced concrete close to the first mill. Repairs to this sheet-piling were not carried out during the mid-year 2015 Off-Crop due to shortage of funds.To our knowledge this sheet piling was protected from corrosion by the use of Cathodic Protection - it seems that this is no longer functional - indeed, it is likely that high staff turnover has resulted in a lack of knowledge of this installation. It is therefore recommended that new Cathodic Protection be ordered and installed to coincide with the repairs of the sheet piling.

5.2.3 There is a Pilot plant which presently produces both Anhydrous and Hydrated Ethanol - the hydrated ethanol is used in the factories as a substitute for Methylated Spirits in the production of slurry for seeding. This Pilot Plant was established by the Institute of Applied Science and Technology (IAST).

5.2.4 About 4ft height of bagasse storage is reported to be unusable due to high levels of moisture absorbed through the earthen section of the floor - this results in a considerable quantity of bagasse being unsuitable for return to the boilers. It is suggested that the entire floor be concreted.

5.2.5 During the 1st Crop, 2015 the turn-out of cane cutters was only 58%, with the maximum during dry weather being 68%. This low level of turn-out does not bode well for the future.

5.2.6 There is a problem with bagacillo supply when Bell loading is being done during wet weather, as the mud in bagasse reduces the quantity and quality of the bagacillo - this therefore has an adverse effect on the filtration.

5.2.7 The brixes of "A", "B" and "C" massecuites are below the desired levels and therefore hinder molasses exhaustion, which, in turn, affects overall recovery. Improvements in boiling practices would assist in attaining the desired Overall Recovery.

5.2.8 **Shortage of Capital**. Albion has been underfunded in their capital works. The 2009 to 2015 Capital summary is shown below:

	CAPITAL (G$ Million)		
YEAR	**REQUESTED**	**RELEASED**	**MADE AVAILABLE (SPENT)**
2009	193.00	158.00	21.50
2010	61.00	61.00	18.80
2011	129.00	129.00	10.05
2012	110.00	110.00	1.99
2013	73.00	0.20	0.32
2014	207.60	207.60	121.30
2015	90.40	90.40	0.00
TOTAL=	864.00	756.20	173.96

5.3 ROSE HALL

5.3.1 There is a drainage problem on this location, necessitated by the need to keep the sideline levels higher than they should be in order to provide cooling water to the Factory - the Management of the Estate have done some work to improve this situation - however, this entails pumping some make-up water from the Canje which, if brackish, can cause major damage to factory condensers and cooling water piping. Caution is therefore urged in this practice.

5.3.2 The high final molasses purity at this location (36.25) is of concern - it is recommended that the Neutch apparatus be used regularly to check the purity drops between the 'C'

massecuite and the molasses produced by each of the Low Grade (LG) centrifugals, as observations during our In-Crop visit suggested that either too much water or steam was being used on one or other LG centrifugal - if this is so the excess water or steam would be dissolving too much sugar and thus increasing the final molasses purity. The lack of flowmeters on the two Western States centrifugals does not allow operators and supervising staff to monitor the quantity of water added to the centrifugal - replacement flowmeters must be provided.

5.3.3 Flowmeters are also needed at the Flocculant station to ensure that the flocculant dosage is equally divided between the two inlets to the clarifier.

5.3.4 The low attendance of cane cutters, once again, concerns us - should the field yields be increased, as expected, in future years, and low turnout of cane cutters continue, the factory will be hard pressed to take off the crop within the opportunity period and grinding into the traditional rainy periods will be the norm with consequent reduction in Overall Recovery of the factory, damage to fields and dams etc.

5.3.5 During our in-crop visit most of the belts on the Heavy Duty knife drive were slipping. Cane preparation was very poor as the distance between the knives and the carrier had been increased to reduce the likelihood of knife chokes. The replacement 'V' belts purchased recently were apparently inferior - quality belts from a reputable manufacturer must always be provided for use in this important application.

5.3.6 The #3 Mill requires special investigation and hinders throughput and mill efficiency - the complaint is that it is not taking the feed and the hydraulic pressure on this mill has been reduced as a consequence. Mill extraction, therefore, has been compromised. Hydraulic gauges and lift indicators on the mills must be functional at all times as these are an essential guide to mill operation.

5.3.7 The John Thompson boilers (5 out of 6 boilers) are not suited to burn mud-laden bagasse. Wood, used as a supplementary fuel in the boilers, cost approximately G$3 Million in 2014.

5.3.8 **Shortage of Capital**. Rose Hall has been underfunded in their capital works. The 2009 to 2015 Capital summary is shown below:

	CAPITAL (G$ Million)		
YEAR	**REQUESTED**	**RELEASED**	**MADE AVAILABLE (SPENT)**
2009	354.20	130.20	42.54
2010	150.2	150.20	35.94
2011	151.7	139.70	33.17
2012	23.60	23.60	0.00
2013	45.00	45.00	0.00
2014	151.00	151.00	17.88

2015	170.00	83.00	0.00
TOTAL=	1045.70	677.70	129.53

5.4 BLAIRMONT

5.4.1 This Estate has one of the better costs per unit (**see Appendix Fac Ops 1**). It also plays an important role in the packaging of sugar for local consumption and export.

5.4.2 The Pre-milling area is considered to be adequate.

5.4.3 There is a cracked Headstock on the Crusher at the Mills which has been repaired by welding and braced against the #1 Mill to reduce the likelihood of the crack opening again. A new pair of Headstocks was supplied by Surendra about 3 years ago and found to be to the wrong design. The headstock from the Wales crusher was sent to Blairmont and also found to be unsuitable.

5.4.4 There is a defect on the 100 tooth gear on the mill drives - this gear has been cracked for the last 3 crops. A replacement gear is expected to be received in October 2015 and is planned to be installed during the end-of-year Off-Crop.

5.4.5 Both Caterpillar diesel-alternators in the Power House are overdue for servicing, one for a top overhaul and the other for a Major Overhaul. Finance constraints have dictated the delay in servicing. The unit which is overdue for a major overhaul, costing approximately G$40 Million, has been derated as a precautionary measure. The overhauls must be done in order to prolong the life of these engines.

5.4.6 Two of the three boilers on this location have travelling grate stokers which make it easier to dispose the high level of ash when the extraneous matter in cane supply is high. However, the # 3 Bigelowe boiler which is de-ashed manually has to be cleaned 2 times/day during rainy weather compared with 1 time/day under normal conditions.

5.4.7 Sugar packaging. Storage for packaged sugar is limited, necessitating frequent collection of the sugar in order to avoid a bottleneck at this point. It is suggested that expansion of the packaging building to the South be made to allow the relocation of a packaging machine from Enmore as required from time to time. This will entail that bins, conveyors etc. be installed so that the basic machine can be hooked up easily when required.

5.4.8 Processing. Efforts should be made to get the non-functioning DCS system working once again.

5.4.9 **Shortage of Capital**. Blairmont has been underfunded in their capital works. The 2009 to 2015 Capital summary is shown below:

	CAPITAL (G$ Million)		
YEAR	**REQUESTED**	**RELEASED**	**MADE AVAILABLE (SPENT)**
2009	1259.00	1199.00	136.38
2010	136.2	136.20	18.10
2011	62.5	62.5	21.99
2012	39.00	39.00	22.28
2013	87.00	8.00	0.00
2014	95.00	95.00	12.20
2015	101.00	101.00	0.00
TOTAL=	1779.70	1641.70	210.95

5.5 EAST DEMERARA ESTATE

5.5.1 The East Demerara Estate is underperforming with its' cost per unit among the highest in the Industry **(see Appendix Fac Ops 1**). Difficulty in generating steam in Enmore factory (LBI having been closed in 2010) necessitates use of copious amounts of wood - the need to toss wood into the furnaces during grinding causes damage to the furnace refractory and moving grates of the bo0ilers. Purchase of wood in 2014 was in excess of G$8 million - this is amongst the highest in the Industry. Remedial action needs to be taken to right this undesirable situation. There are 2 mechanical harvesters and 9 bell loaders at this location - this results in excessive mud being delivered to the factory during, and some days after, rainy weather. This excess mud affects the process negatively.

5.5.2 It is recommended that the reverse rotation Heavy Duty knife and drive at LBI be relocated to EHP as this would assist in improved preparation of the cane, lower bagasse moisture and improved steam generation.

5.5.3 The arrangement whereby LBI canes are routed to EHP via the closed LBI factory must be discontinued and the more direct route be utilised - this will assist in reducing the high BGI and cost of cane transport.

5.5.4 The existing functional 8' Diameter x 16ft long Rotary Vacuum Filter is under capacity, particularly when dealing with dirty cane entering the factory. The additional filter, presently on Capital, is necessary to cope with the clarifier muds. In view of the fact that this location is the major unit for the production of packaged sugar it is imperative that all efforts be made to supply clean cane to the factory so that the quality of packaged sugar can be maintained - failure to do so will inevitably result in lost export markets.

5.5.5 Every effort should also be made to retain the highest quality production staff, suitably qualified, at this location in view of the important task of maintaining a high quality packaged sugar at all times.

5.5.6 There is need to complete the rationalisation of the two Estates to achieve improved control and lower costs.

5.5.7 **Shortage of Capital**. East Demerara Estate has been underfunded in their capital works. The 2009 to 2015 Capital summary is shown below:

	CAPITAL (G$ Million)		
YEAR	**REQUESTED**	**RELEASED**	**MADE AVAILABLE (SPENT)**
2009*	375.20	277.20	64.61
2010	159.00	159.00	67.02
2011	282.60	282.60	243.72
2012	259.60	259.60	7.35
2013	163.50	48.50	5.34
2014	150.00	150.00	43.67
2015	210.00	200.00	0.00
TOTAL=	1599.90	1376.90	411.71

* Sum of Capital for LBI & EHP factories prior to formation of East Demerara Estate.

5.6 WALES

5.6.1 There is a low cane cutter attendance (approx 48%) at this location which results in the factory being unable to achieve a reasonable number of grinding hours weekly. Estate cane yields are very low, averaging 39.82 Tonnes Cane per Hectare (TC/Ha) - this compares unfavourably with farmers' cane yields which are 59.35 TC/Ha.

5.6.2 There is a shortage of steam at this location as the #1 Boiler, an old rivetted design, was removed in 2000 and the crusher removed shortly thereafter due to an inadequacy of steam. The factory have concentrated recently on improving lagging, improved servicing of steam traps and reducing power requirements by better utilisation of the injection pumps - this has resulted in a much reduced time loss for Low Steam. When clean hand-cut cane was supplied in former years there was need only to clean the #2 boiler (Babcock & Wilcox) once per week - with the advent of mechanically loaded cane it has become necessary to clean much more frequently and the factory has to stop crushing whilst this boiler is being cleaned.

5.6.3 With the removal of the crusher this factory is now a 3 tandem Mill with the resultant reduction in Mill Extraction.

5.6.4 The Wales boiling house has the capacity to process 120 TCH - however, the throughput has been reduced to 100 TCH.

5.6.5 The wharf is in need of urgent repairs and the shipping of sugar by barge is compromised due to the need for a new self-propelled barge.

5.6.6 This estate is largely dependent on the supply of farmers' cane - however, in recent years, due to the decline in the sugar price, some of the farmers have changed to the cultivation of rice, pineapple and other crops - every effort must be made to bring those farmers back on board.

5.6.7 **Shortage of Capital**. Wales factory has been underfunded in their capital works. The 2009 to 2015 Capital summary is shown below:

	CAPITAL (G$ Million)		
YEAR	**REQUESTED**	**RELEASED**	**MADE AVAILABLE (SPENT)**
2009	183.20	148.20	46.75
2010	67.00	67.00	12.77
2011	75.00	75.00	33.39
2012	58.74	58.74	20.94
2013	111.00	0.00	0.00
2014	100.00	100.00	3.71
2015	190.00	190.00	0.00
TOTAL=	784.94	638.94	117.56

5.7 UITVLUGT

5.7.1 Turn-out of cane cutters at this location is approximately 50%. The supply of cane is only enough to keep the factory supplied for an average of 18 hours per day - cane therefore is often accumulated so that the factory can get a reasonable run, in order to reduce fuel use etc. This accumulation of cane increases the burning to grinding interval, which in turn reduces the recovery of sugar and affects sugar quality.

5.7.2 About 65 - 70% of estate canes is Bell loaded. Estate cane yields are very low (43 TC/Ha). Four out of a complement of 5 boilers in the factory are of the older John Thompson (JT) type that do not tolerate the increased levels of extraneous matter (mainly mud) which results from the mechanical loading of the canes. The JT boilers are being cleaned not more than 3 times per week, whereas the Thorn International (T.I.B.S) boiler, which has furnaces with dump grates, is cleaned once per shift. Copious supplies of wood are used in the factory to supplement the bagasse as fuel to the boilers.

5.7.3 It is our considered view that the frequency of cleaning of the JT boilers should be increased in an effort to determine whether it would be more economical to pay for the extra cleaning than purchasing large tonnages of wood. Purchase of wood in 2014 was in excess of G$12 Million.

5.7.4 This factory supplies bagged sugar to the local market. The wooden cladding on the bodies of all evaporators, pans and juice heaters needs to be refurbished - this will

reduce heat loss and assist in the reduction of steam demand.

5.7.5 **Replacement Boiler**. The increase in extraneous matter resulting from the change to mechanical loading (and possibly mechanical harvesting in the future) at Uitvlugt will require the upgrade of the Boiler plant. One new 132,000 pph (lbs per hour) boiler can replace the four (4) older type John Thompson boilers. Estimated costs are as follows:

60 tph (tonnes per hour) boiler, complete with CAD stoker .....US$4 Million F.A.S.
Estimated other costs (shipping, freight, foundation, erection)...US$1.5Million
Total Installed Cost..... ..US$5.5Million.

The new boiler will be complete with chimney, heat recovery equipment and wet gas scrubber to satisfy high environmental standards of flue gas emissions.

5.7.6 **Shortage of Capital**. Uitvlugt factory has been underfunded in their capital works. The 2009 to 2015 Capital summary is shown below:

	CAPITAL (G$ Million)		
YEAR	**REQUESTED**	**RELEASED**	**MADE AVAILABLE (SPENT)**
2009	194.70	164.70	45.10
2010	87.00	87.00	78.51
2011	91.20	86.80	9.86
2012	73.10	73.10	1.94
2013	66.20	0.00	0.00
2014	104.00	104.00	8.03
2015	164.95	0.00	0.00
TOTAL=	785.15	515.60	143.44

6 FACTORY OPERATIONS HEAD OFFICE ORGANOGRAM

The current organization structure (**see Appendix Fac Ops 7**) of Factory Operations places an excessive work load on the General Manager, Technical Services, and must be restructured for a better distribution of duties. It is acknowledged that the current Manager has the institutional memory, but given the backlog of capital projects and the urgent requirement for a greater attention to detail to increase operational efficiencies in all areas, the following structure (**see Appendix Fac Ops 8**) is proposed. It seeks to reactivate a former structure (with minor modifications) which worked well. It is the understanding that suitably qualified and experienced staff will be recruited from within, in the first instance, followed by external recruitment, if found necessary.

Training in all operational areas is a vital component and must take special note of new technology and the thrust towards automation.

7 PRIORITY FACTORY PROJECTS 2016-2020

A severe shortage of Capital spending on all factories (except Skeldon) has been identified, particularly during the years 2009 to 2015. By way of explanation GuySuCo has stated as follows: "*Regarding capital expenditure tables, released versus spent, underspend is attributable to not only lack of funds but also to a lack of capacity (in the team) to spend when funds were available earlier in the year (in each of the years). This lack of capacity (project management & engineering line management inexperience) got progressively worse each year*".

GuySuCo's Factory Operations Department was requested to identify their Priority Factory Capital Project requirements for the 5-year period 2016 – 2020. The lists, which also includes Capital requirements for Skeldon factory, are attached **(see Appendix Fac Ops 9**).

8 DEMERARA SUGAR TERMINALS (DST).

8.1 DST is responsible in the main for the storage and shipping of bulk sugar and molasses within and without Guyana. More importantly, it arranges storage and shipping in a timely manner to GuySuCo's overseas buyers American Sugar Refiners (Tate & Lyle) at Thames Refinery, and others.

8.2 The installed storage capacity at DST is 40,000 Tons of Bulk Sugar - however, at the time of our visit on 17th August, 2015, only one of two bonds was in operation awaiting the purchase and installation of a new Steelband conveyor belt - the functional storage at the time was therefore reduced to 50% of its' capacity i.e. 20,000 Tons. Were Skeldon's production to improve as is indicated at present, DST will be hard pressed to cope with the restrictions occasioned by the enforced closure of one of its bonds.

8.3 Other vital pieces of equipment are old and in urgent need of replacement. The two grabs which unload sugar from the coastal vessels suffer frequent breakdowns as the electrical controls are obsolete and spares for the drum controllers and other electrical components are no longer available. Efforts should be made to replace the electrical drive motors and other components with variable frequency drives, joy-stick controls and other up-to-date equipment - it is assumed that the mechanical components, such as the gearboxes, grabs etc., although old, still have many years of useful life and do not need to be replaced at the present time.

8.4. The old Broome & Wade compressor which provides air for the proper functioning of the sugar scales, needs to be replaced. DST staff have indicated that the compressor's governor is faulty, no replacement is available due to obsolescence and, in order to avoid exceeding the over-pressure that can cause major damage, air is being released to atmosphere constantly. The restraint on Capital expenditure has resulted in the non-approval, to date, of a new compressor (DST's estimated cost G$5 Million).

8.5. The non-dredging of the Demerara River Navigation Channel is a hindrance which restricts individual sugar shipments to an average cargo of 8,000 to 8,500 tonnes instead of the previous capability of 12,000 to 13,000 tonnes. The Manager of DST advises that

the original draught of the 12 to 15 kilometer channel was approximately 6.9 metres. This draught is now reduced to about 5 metres because of siltation (with a sailing draught of about 4.5 metres, leaving about 0.5 metres for the keel of the vessel). This shipping restriction, added to the temporary storage limitation of 20,000 tonnes, is a source of grave concern as any delay in the arrival of ships may result in factories having to stop production during the peak weeks of the 2nd Crop 2015 due to sugar congestion.

8.6 The DST electrical system operates on 50 Hz - steelband conveyors, compressor and other equipment operate on this frequency. The changeover to 60 Hz by GPL prevents this source from being used to power DST at present. DST's stand-by generator, a 600 KVA Perkins, 5 years old, has to be used whenever unloading sugar from coastal vessels or loading sugar for export. Conversion of the equipment to 60 Hz will be costly but needs to be considered in the long term - in the short term it may be prudent to source another stand-by unit that can be operated at both 50 Hz at present and 60 Hz in the future - this will allow quick changeover in the event of a failure of the stand-by generator during loading of ships, as resort to GuySuCo's Caterpillar mobile set or rentals, when failures occur, can cause inordinate delays.

8.7 There are leaks in the roofs of the Sugar Grab area and the offices. These roofs need to be fixed as soon as possible. Minor leaks in one of the sugar bond roofs were also observed. DST has requested G$10 Million in Capital for 2016 to fund roof repairs.

8.8 Renewal of the Cathodic Protection at the wharf is necessary in order to prevent corrosion of the Rendex piles supporting the wharf and outloading conveyor structure. DST has requested G$10 Million in the 2016 Capital Budget for the replacement of the Cathodic Protection unit. This is considered to be a priority.

8.9 It must be stressed that DST is a main artery in the GuySuCo system and any dislocation will cause major disruption throughout the industry.

9 PROCUREMENT

9.1 The Materials Management Department (MMD) is a also vital arm of the Industry. Its effectiveness, however, has been severely hampered by the fact that sufficient funds have not been available industry-wide for the timely acquisition of spare parts and equipment - as a consequence, standards of maintenance in all factories have been compromised with the obvious deleterious effects on efficiency. In the circumstances, therefore, careful thought and planning is required in the usage of the scarce resources available.

9.2 There is abundant evidence that factories, in raising Purchase Requisitions (PR's), have been delinquent in providing sufficient and accurate information, with the result that unnecessary delays in acquisition of items occur - there is an urgent requirement for training in this area. In some cases where the incorrect items were supplied despite the correct specifications from the MMD, suppliers have refused to refund monies already in their possession - this has resulted in some suppliers being black-listed -

notwithstanding this, however, a more robust effort must be made to recover the monies owed.

9.3 The high level of Obsolescent spares is of concern and requires urgent attention, as a large inventory rests on Estates and the MMD.

10 PLANNED MAINTENANCE

10.1 In the presentation to the COI on 8th August 2015, Peter Roberts, a specialist in Non-Destructive Testing and Planned Maintenance systems made the following remarks in his overview on the topic "Reliability Perspective":

"*Maintenance is critical to productivity and life expectancy of physical assets. Improperly maintained or neglected plant requires expensive and frequent repairs leading to unnecessary loss of financial resources and poor use of human resources. Additionally, factory breakdowns lead to production and financial loss as well as induce stress on human resources".*

Such a situation is applicable to GuySuCo today, since its financial resources are intolerant to improper planning and execution which leads to costly wastage.

10.2 The factory team's visits to Estates have revealed that Planned Maintenance systems are not operating properly and financial constraints are not helpful in this situation. Accurate records on which the system thrives are not up-to-date and there is an urgent need for intensive training in all aspects of the system including all managerial and non-managerial staff so that, among other things, critical assets are identified. Competent trainers are available and should be engaged to remedy this obvious lapse in the maintenance systems.

11 CANE FARMING

11.1 Cane Farming plays an important role in the production drive in GuySuCo. It is therefore necessary that a harmonious relationship exists between farmers and the Company. In terms of processing their canes the main concern lies with the result of the Tonnes Cane per Tonne Sugar (TC/TS) ratio. In the farmers' opinion, this ratio is too high as they allege that the cane they deliver is of better quality than the Estate's cane for which the TC/TS ratio is much lower. It is therefore the cane farmers' belief that some form of cheating takes place in the computation of their results.

11.2 An investigation into the procedures followed by the estate in handling of the farmers' cane revealed no malpractices along the way leading up to the allocation and declaration of the farmers' sugar from the cane delivered to the factory, hence the calculated TC/TS that results. The procedures followed by the estate personnel are clearly documented in the laws of Guyana National Cane Farming Committee Act Chapter 69:4.

11.3 The estates' laboratory staff are responsible for ultimately producing the results of the

farmers' cane by a method of sampling and analysis of the first expressed juice of the cane from which the brix, pol and purity are obtained therefrom. The results are incorporated into a formula, known as the Puerto Rican Formula and then ultimately combined with the results of the factory's cane juice which is used in the allocation process, in accordance with the Act.

11.4 Because of the Organisation Structure of the factory laboratories, it would be very difficult for any of the staff to tamper with the results of the farmers' cane in terms of the TC/TS ratio. Any fraudulent act would have to be a unified collaborative effort which does not seem possible.

12 ETHANOL

12.1 In as much as ethanol is a good source of energy in the fuel chain, its production at the present time and perhaps in the near future doesn't seem a viable option for GuySuCo to venture into (**refer Section 10.3 of Agriculture Report for detailed assessment of Ethanol**). The main reason for this is the continual fall in price of fossil fuels (gasoline and diesel). The recent find of off-shore oil deposits in the western sea bed of Guyana also makes the choice of ethanol less attractive at present.

13 REFINERY

13.1 The idea of producing a high quality "Bottlers Grade' refined sugar seems attractive. There exists a ready market in Caricom for a total of 200,000 metric tonnes of refined sugar of which Guyana's share is approximately 5,000 tonnes imported between GuySuCo and other industrial users. In order for the production of refined sugar in Guyana to be profitable, however, securing 40% CET is vital. To qualify for the CET the production of at least 75% of regional consumption will be necessary. Bearing in mind that all of the refined sugar for Caricom is imported, and the increased production of raw sugar by GuySuCo projected for approximately the next 5 years, it would seem to be lucrative to invest in a Refinery to process the excess raw sugar. However, the present price differential on the world market between raw and refined sugar is such that refining may not be justified. An updated feasibility study must be conducted to determine the way forward.

14 CO-GENERATION

14.1 The proceeds from the sale of raw sugar, particularly after 2017 when the EU abolishes sugar quotas, will pose enormous financial problems for a sustained industry, contracted or otherwise. Added-value products are necessary. In our view the main contributor to added-value to sustain the Sugar Industry in the long term will be Co-generation. This excess electrical power, generated by steam from Boilers fed with bagasse, can be provided by selected factories to the National Grid. Initial Capital costs are high as new high pressure Boilers, Turbo-alternators and associated equipment are required for this venture. The returns, however, are good provided favourable Power Purchase

Agreements can be negotiated with Guyana Power & Light.

The new Skeldon factory was designed to provide firm power to the Guyana Power & Light, In-crop by steam driven turbo-alternators and Off-crop by Wartsila Diesels. The experience gained from Skeldon can be utilized to convert other factories to provide power to the Grid.

A combined Albion/ Rose Hall factory, on a greenfield site with a capacity of 250 Tonnes Cane/hour (TCH) is suggested as the next co-gen facility to be considered. Instead of a Diffuser, however, the existing Milling plant at Albion, with the addition of 2(two) mills to take the milling tandem to a total of 6 mills is preferable. The mills at Albion, with minor modifications, are capable of a throughput of 250 TCH. The clarifier at Albion is also capable of an upgrade to 250 TCH.

From the foregoing, an attempt should be made to initiate a feasibility study of some estates which should include a thorough examination of similar co-generation projects elsewhere. In the latter regard, Mauritius comes readily to mind.

15 ENVIRONMENT

15.1 Samples of the factory effluents and discharges are taken by the factory laboratory staff, subdivided and analysed by both GuySuCo's Central Laboratory and the Environmental Protection Agency (**Refer Agriculture Report Section 9.2).**

16 MANAGEMENT

There is evidence that management performance has been adversely affected by unnecessary costly and ill thought out interventions.

Visits to Estates revealed not a little frustration reportedly due to some sharp management practices in the areas of placements and promotions. The standardized system of merit awards worked well in the past and should be resuscitated.

17 CONCLUSIONS

17.1 Given the financial constraints of the Government Of Guyana (GOG), notwithstanding its commitment and support for the sugar industry, it is apparent that the injection of funds, as needed by the Industry, cannot be satisfied.

The rejuvenation and the revitalization of the Sugar Industry with assurances of adequate funds for its various operations will have to be sourced from Private Enterprise. In this regard the privatisation of GuySuCo is recommended.

17.2 The commissioning of the Skeldon Factory was poorly managed and the Project should not have been taken over. It continues to require huge financial inflows to satisfy its

Capital and Routine needs. An effort should be made to seek adequate redress.

17.3 From as far back as 2009, the Industry has been unable to satisfy fully its Capital and Routine requirements. As a consequence improvements to Factory plant have been neglected due to an inordinate sum of money having to be spent on Skeldon factory. Factory efficiencies suffered.

17.4 All Estates are unable to break even in the short or medium term and unit costs of production are unacceptable. Whilst Albion, Rose Hall and Blairmont show prospects of improvement, Wales and Uitvlugt pose challenges to continuity. Additional cane farming on these two Estates is crucial to their survival.

17.5 The industry can no longer rely solely on the production of Raw Sugar. Added -value products are required. In addition to Skeldon, serious consideration should be given to Co-generation at a combined Albion/Rose Hall factory, on a green-field site, in the near future, provided this project could be co-funded by private capital.

17.6 The unit cost at East Demerara Estate is amongst the highest in GuySuCo. The proposed upgrade of Enmore Factory, recommended in 2010, at a cost of G$466 million, should be implemented to further the interest of value-added packaged sugar produced at this location. It should be noted, however, that this upgrade should be commensurate with matching field production.

17.7 The 2009 - 2013 and 2013-2017 plans have been overtaken by recent events and the projections are unrealistic.

17.8 With the conversion, at all factories, to load-cell cane scales, there is absolutely no justification for continuing with the current format for scale testing and this should be discontinued forthwith, and replaced by a reduced presence of representatives. The presence of several union representatives is considered a costly waste of human and financial resources.

17.9 All incentive schemes should be based on productivity and should have a high percentage attendance qualification requirement.

17.10 Given the possibility of a change in Management of the Industry, workers' entitlements should not be compromised. Leasing of land to qualified permanent workers for agricultural purposes may be one of the favourable considerations.

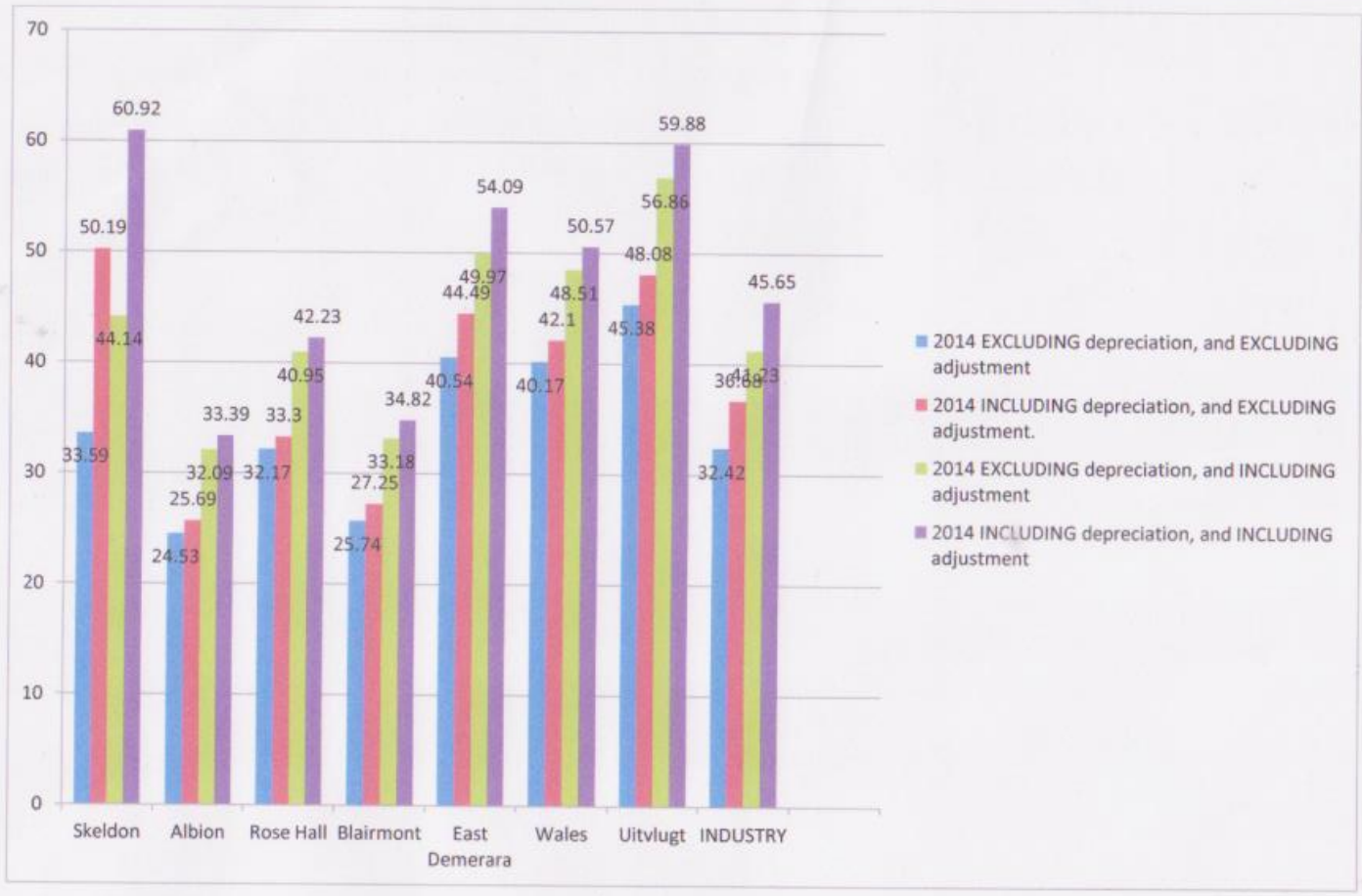
17.11 Every effort should be made to maintain staff houses and other staff welfare facilities in a proper state, as visits to Estates have revealed that, on most locations, there is need for considerable improvement. The reason for the neglect has reportedly been the non-availability of funds.

18 SUMMARY OF FINDINGS & RECOMMENDATIONS

	SUMMARY OF FINDINGS	RECOMMENDATIONS
1.	The commissioning of the new Skeldon factory was a disaster. The factory should **not** have been accepted with so many faults.	Redress should be sought from the Project Managers and/or Turn-key contractor.
2.	Adequately trained local counterparts were not in place before commissioning of the Skeldon factory. This is considered a major oversight.	Additional training, especially in the areas of automation, is required to cope with the new technology at SWR and other estates.
3.	Specification of sand and ash %cane of <3% for the new Skeldon factory is considered to have been a major blunder.	Consider changing the Boiler Pin-hole grates to Continuous Ash Discharge (CAD) stokers to cope with the high levels.
4.	The exclusion of Rotary Vacuum Filters from the design of the Skeldon Factory was a flawed decision.	Install Rotary Vacuum filters and bagacillo collection system of sufficient capacity.
5.	There appears to be an absence of adequate drawings of the new Skeldon plant (drawings are vital for the proper understanding of the functioning of equipment).	Request Booker-Tate and/or CNTIC to supply a complete set of drawings (in English).
6.	Entrainment has prevented the use of 1st vapour condensate at Skeldon.	Better control of boiling levels in the 1st effect evaporators is suggested, in the first instance.
7.	Increased mechanization has resulted in high levels of extraneous matter (especially field soil).	Better supervision of harvesting operations, especially during wet weather.
8.	All factories, except Skeldon, were starved of funding for Capital and routine expenditure, as far back as 2009. This situation precipitated the substandard performance of the other factories.	Funds must be made available to put the factories in reasonable operating mode.
9.	Some staff displayed inexperience in basic factory operations.	Accelerate training.
10.	Restructuring of Factory Ops. H/O is an urgent necessity for better work distribution and efficiency.	Refer to suggested structure in Appendix Fac Ops 8.
11.	The sale of the Steam & Power component of the Skeldon factory to Skeldon Energy Inc. is disadvantageous to GuySuCo.	Seek reversal of this sale.
12.	The rates per KWH for sale of power to G.P.L. from the co-gen plant at Skeldon are too low.	Seek a renegotiation of the Power Purchase Agreement between GuySuCo and GPL.
13.	GV and ICBU suffer immensely from shortage of canes.	These Estates should be rationalized should additional canes not be forthcoming from farmers.
14.	Cane Scale testing on Estates wastes valuable and scarce resources.	With the advent and accuracy of Load Cells it is not necessary to check scales on a weekly basis.
15.	Staff welfare facilities have suffered from neglect in the past few years.	Funds should be made available to upkeep the facilities to enhance staff

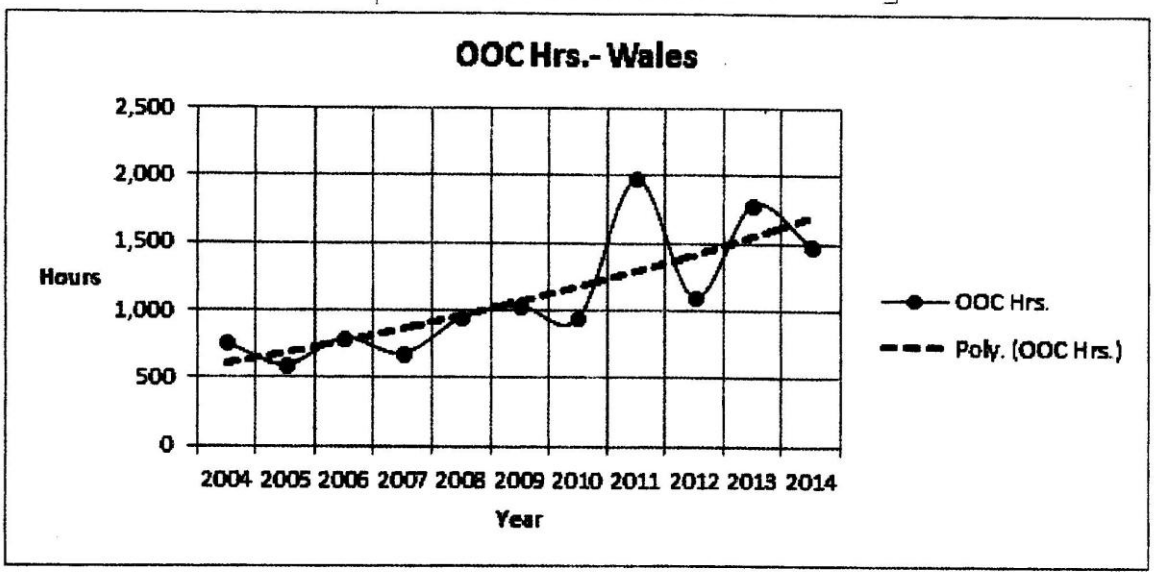
		morale.
16.	Factories have discontinued the measurement of the RS/A (Reducing sugars to Ash ratio), a measurement of the exhaustibility of molasses.	Factories to reintroduce this analysis with immediate effect.
17.	Externally influenced management decisions were not in the best interest s of informed technical decisions.	Management must be given the freedom to act professionally.
18.	In aggregate, huge sums of money are required to put the industry on a satisfactory operating mode.	Urgently encourage and involve the private sector in the management of the Industry.
19.	The Co-gen aspect, amongst others, of the Skeldon factory, requires immediate technical assistance .	Provide assistance at the earliest opportunity bearing in mind the financial benefits of Co-Gen.
20.	DST not operating at maximum capacity and efficiency.	Dredge the Demerara Navigational Channel to increase sugar cargo levels.

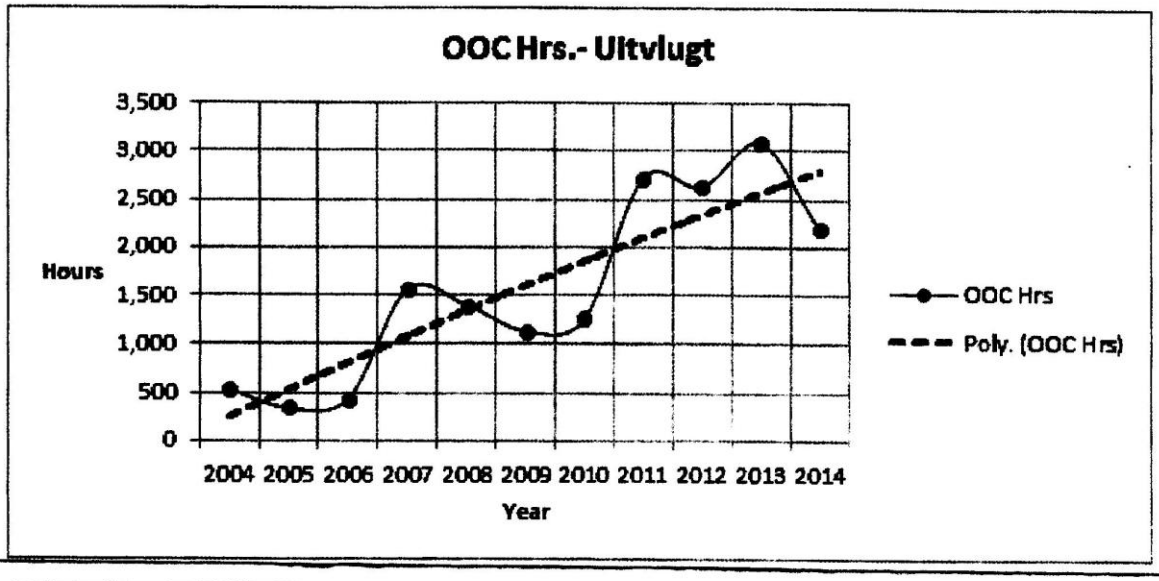
APPENDIX Fac Ops 1



ESTATES 2014 PRODUCTION COSTS
(US cents/lb)

APPENDIX FAC OPS. 2





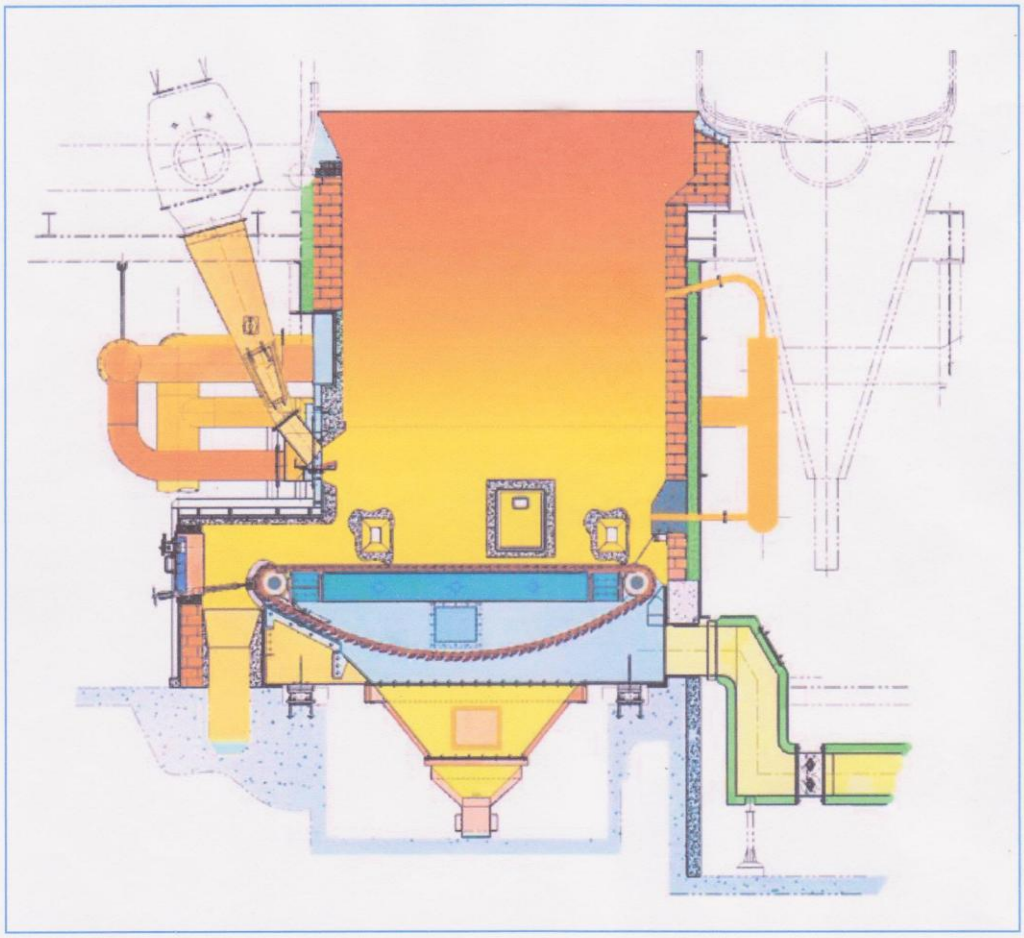
Year	Wales	Uitvlugt
2004	756	530
2005	599	343
2006	796	441
2007	680	1,559
2008	947	1,392
2009	1,037	1,132
2010	942	1,256
2011	1,972	2,719
2012	1,102	2,628
2013	1,786	3,080
2014	1,489	2,190

APPENDIX FAC OPS 3

Case Study No.38
Continuous Ash Discharge Stoker Retrofit on Two Boilers

Features

- Catenary tensioned
- Continuous ash removal
- Self cleaning
- Variable speed drive
- Improved boiler availability
- Handles a wide range of fuels
- High combustion efficiency
- Low maintenance
- Uniform fuel and air distribution resulting in stable combustion



john thompson

ACTOM

Boiler and Environmental Solutions

Continuous Ash Discharge Stoker Retrofit on Two Boilers

Background

In 2007, Illovo Sugar placed an order with John Thompson to supply, deliver and erect Continuous Ash Discharge Stokers and ancillaries for their two Volund boilers at the Kilombero K2 Factory in Tanzania.

The Mill wished to overcome the problems associated with large quantities of sand being brought in with the cane and consequently in the bagasse.

Erratic load swings were encountered and the boilers were unable to maintain steam pressure when:

- The Horseshoe Furnaces were manually de-ashed and
- The ash percent bagasse rose to very high levels particularly during the wet season.

Other modifications were carried out to the boilers to facilitate the installation of the CAD Stokers. These included the design, supply, delivery and installation of:

- Modified steel cased, refractory lined furnaces
- Pneumatic bagasse spreaders
- Spreader air fans and motors
- New secondary air nozzles
- Revised hot air ducting and dampers
- Hydraulic ash and grit sluicing
- Variable speed stoker drives integrated into the control system.

Plant and equipment was delivered from February 2008. Erection began in March/April and both boilers were commissioned in mid June.

Due to the combination of a short offcrop and the requirement for extensive civil works below the boilers, it was decided to assemble the framework outside of the boiler support frames. This demanded revised methodology which was developed by John Thompson in which tracks were laid either side of each boiler, extending over the unfinished civil works below.

The main frames were supported on the tracks by a series of tracked crawlers. Upon completion, the frames were rolled in under the boilers and rigged onto pre prepared bearings.

The installation was erected under the supervision of John Thompson personnel with artisans from RSA and local labour. John Thompson personnel also supervised the commissioning.

Furnace

The original furnaces were of the self feeding type with suspended arches designed by Liptak Bradley.

The arches and attendant steelwork were entirely dismantled before the start of civil works to accommodate the coarse and riddlings hoppers.

The new furnace construction is of the parallel sided, refractory lined and steel cased type.

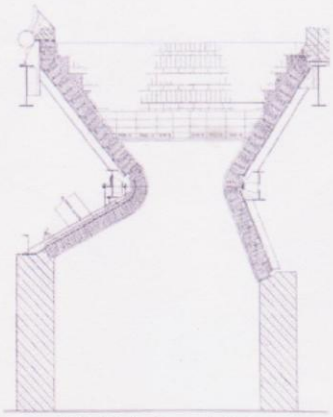


FIG 1: Existing Suspended Arches

The new frontwall casings, accommodating two new pneumatic bagasse spreaders, are air-cooled, utilising spreader air from the new Secondary Air Fan.

Two rows of secondary air nozzles were fitted to the rear furnace wall.

C.A.D. Stoker

The stoker is of the conventional John Thompson type, discharging ash/sand at the front.

The stoker mats are driven by variable speed drives through planetary gearboxes with torque limiters and multi misalignment couplings. The stokers are catenary tensioned, eliminating the need for separate tensioning devices.

The mat consists of a series of several bands of grate bars attached to pairs of chains. The bars are manufactured from high grade cast iron, substantially ribbed to provide rigidity as well as a large surface area to maximize the cooling effects from the undergrate air. The chains are driven by toothed sprockets on the front shaft and pass over guide rollers at the rear. The grate bars run on a series of cast iron skid rails bolted on to the stoker frame.

Spring-loaded shoes prevent the grate from opening prematurely at the front, which would otherwise allow the entrapment of foreign material such as sand, stones, tramp metal and the like. The grate bars are designed to hang open on the return chain strand allowing ash and riddlings to fall freely into the hoppers.

The ash/sand mix is hydraulically sluiced into a holding pit between the boilers, from which it is pumped to a beach clarifier.

Riddlings are similarly sluiced into the holding pit for disposal.

Hot air is introduced into the rear of the stokers from the existing airheaters via revised hot air ducting and dampers.

Operation

The boilers were originally rated at 40 t/h but this evaporation was rarely achieved due to the de-ashing problems. Outputs below 50% of rated capacity were frequently experienced.

Manual de-ashing was also hazardous due to unstable combustion and associated puffing.

Subsequent to the retrofit, uninterrupted outputs of 40 t/h and above have been achieved without any manual intervention.

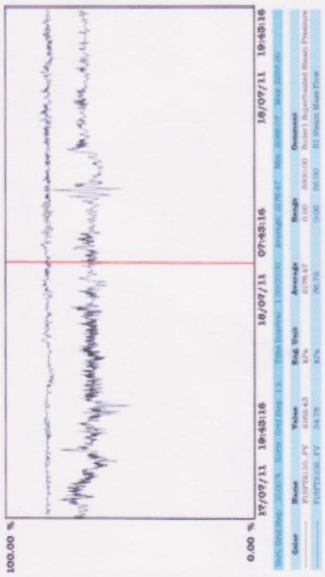


FIG 2: Steam Flow/Pressure Chart after Retrofit.

Boiler and Environmental Solutions

JOHN THOMPSON a division of ACTOM (Pty) Ltd.

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03/2015

APPENDIX FAC OPS 4

GOI FACTORY TEAM'S VISITS TO ESTATES AND RELATED DEPARTMENTS AND SENIOR PERSONNEL WITH WHOM INTERACTED

ITEM	VISIT DATE	ESTATE / DEPT.VISITED	ESTATE MANAGER	AGRICULTURE MANAGER	FACTORY MANAGER	FINANCE MANAGER	HUMAN RESOURCES MANAGER	OTHER
1	THUR., 02-07-2015	SKELDON	J.LONCKE (AG)	N.PHOENIX	B.PERSAUD(AG)	A.POORAN(AG)	MS. K. DeFREITAS	-
2	FRI., 03-07-2015	SKELDON	J.LONCKE(AG)	N.PHOENIX	B.PERSAUD (AG)	A.POORAN(AG)	MS. K. DeFREITAS	-
3	WED., 08-07-2015	ALBION	H.GRIFFITH(AG)	I.SUCOOR (AG)	N.PERSAUD	-	V.WALTERS	-
4	THUR., 09-07-2015	ROSEHALL	Y.MANNA	V.SUBRAMANI	DEODAT SINGH	MS.M.PETERKIN	A.SINGH	-
5	TUES., 14-07-2015	BLAIRMONT	V.RAMNANDAN	P.PERSAUD	B.DHANRAJ	D.CHETRAM	L.PERSAUD	-
6	WED., 15-07-2015	EAST DEMERARA ESTATE(EHP)	C.VICTORINE	J.THOMAS(AG)	N.PERMANAND	MS.B.BRISTOL	R.HANIFF	-
7	THUR., 16-07-2015	WALES	T.SIMON(AG)	D.DHANRAM(AG)	C. OYEYIPO (AG)	MS.J.DOLPHIN(AG)	D.WILLIAMS	-
8	FRI., 17-07-2015	EAST DEMERARA ESTATE(LBI)	C.VICTORINE	-	-	-	-	FIELD MECHANISATION MEETING— R.SANGSTER, Y.PERSAUD, ANDRE PAUL, W.COLLINS (REG, WORKSHOP MAMAGER), C. MACK
9	TUES., 21-07-2015	UITVLUGT	Y.PERSAUD	N.NARINE	L.NILES	P.RAMPERSAUD	MS.N.SEARS	
10	TUES., 28-07-2015							FACTORY OPERATIONS DEPT.(LBI) Y.ABDUL,G.M TECHNICAL SERVICES
11	FRI., 31-07-2015	ALBION	H.GRIFFITH(AG)	I.SUCOOR (AG)	N.PERSAUD	-	V.WALTERS	-
12	FRI., 31-07-2015	ROSEHALL	Y.MANNA	V.SUBRAMANI	DEODAT SINGH	-	A.SINGH	-
13	THUR., 06-08-2015	BLAIRMONT	V.RAMNANDAN	P.PERSAUD	B.DHANRAJ	D.CHETRAM	L.PERSAUD	-
14	THUR., 13-08-2015	EAST DEMERARA ESTATE(EHP)	C.VICTORINE	S.SADIQ	N.PERMANAND	-	R.HANIFF	-
15	WED., 19-08-2015	-	-	-	-	-	-	DEMERARA SUGAR TERMINALS— R.FEREIRA, MANAGER
16	WED., 19-08-2015	-	-	-	-	-	-	FACTORY OPERATIONS (LBI) -- D.SHARMA, MANAGER
17	THUR., 20-08-2015	UITVLUGT	Y.PERSAUD	N.NARINE	L.NILES	P.RAMPERSAUD	MS N.SEARS	-
18	SUN., 23-08-2015		-	-	-	-	-	FACTORY OPERATIONS (LBI) -- D.SHARMA, MANAGER
19	WED., 26-08-2015	-	-	-	-	-	-	MATERIALS MANAGEMENT DEPT.,OGLE-- V.GOBIERDAN, MANAGER,
20	THUR., 27-08-2015	ROSEHALL	Y.MANNA	V.SUBRAMANI	DEODAT SINGH	-	A.SINGH	-
21	THUR., 27-08-2015	SKELDON	K.BRAMDEO	N.PHOENIX	J.LONCKE	-	K.DeFREITAS	
22	FRI., 28-08-2015	SKELDON	K.BRAMDEO	N.PHOENIX	J.LONCKE	-	K.DeFREITAS	

COMMENTS:

1) On arrival on estates,the team met firstly with Estate Managers and heads of the various departments.
2) Various aspects of estates 'operations and,in particular,the 2015 sugar production estimates were examined in great detail.Historical performances in both field and factory were noted and strengths and weaknesses identified.
3) Some visits to Estates and Departments were made either singly or jointly with the Field Team when the opportunity was taken to visit estates' factories as well as fields.Careful note was taken of the levels of extraneous matter presented to factories and its impact on operations
4) Visits to factories during the non-grinding and grinding periods enabled the team to assess clearly the impact on operations of the severe financial constraints.
5) The impact on field operations of the financial constraints were also noted.
6) Staff welfare was also taken into account.
7) A very lively interaction with management and non-management workers was evident throughout the visits.

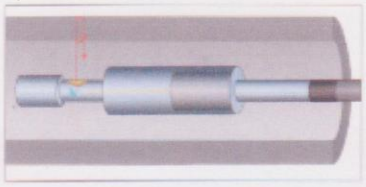
INTERNAL ROTATING INSPECTION SYSTEM
HIGH-SPEED ULTRASOUND OPTION

NONFERROUS HEAT EXCHANGERS • NEAR-DRUM • AIR COOLERS • BOILERS • CARBON STEEL HEAT EXCHANGERS

The TC5700 features a unique 4-channel ultrasonic option, expandable to 16 channels. This option is suitable for tube profilometry or crack detection using IRIS, motorized, or multielement UT probes. It is also suitable for steel plate corrosion mapping using a linear array of transducers.

IRIS

The UT option was designed to use the IRIS probe. IRIS is an ultrasonic technique well suited for petrochemical and BOP tube inspections. The technique uses an ultrasonic beam to scan the tube ID surface in a helicoidal pattern ensuring that the tube full length is tested. The TC5700 monitors the frontwall and the backwall echoes in order to measure the tube wall thickness.



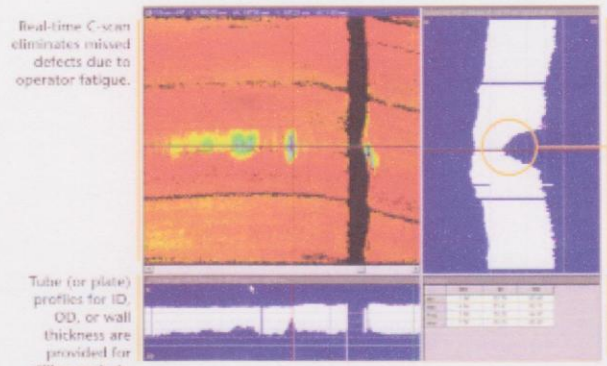
In the setup mode, the user makes adjustments with visual feedback of the waveform on an A-scan display. This permits optimizing the settings and assisting in troubleshooting probes and cables.

In acquisition mode, a color C-scan (wall thickness map) and a B-scan (IRIS oscilloscope-like display) are displayed simultaneously in real time. After every rotation of the turbine, the B-scan is updated and a line is added to the C-scan. The C-scan scrolling can be continuous or synchronized with an encoder.

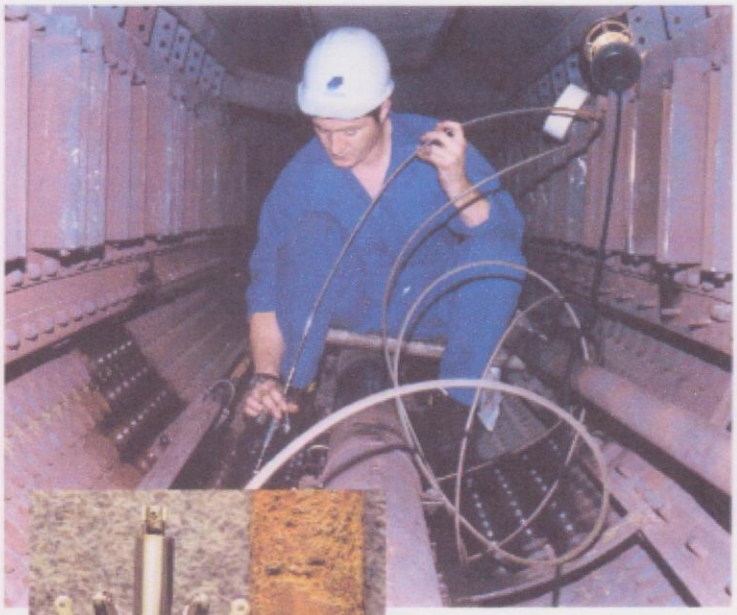
Applications

- IRIS tube profilometry
- Boiler tube inspection (IRIS or multichannel)
- Near drum inspection (crack or corrosion)
- High-resolution motorized probe tube inspection
- Tube inspection using 8- or 16-channel nonrotating high-speed probes
- Steel plate corrosion mapping (4 or 16 channels recommended)

The TC5700 display provides the analyst with extensive information for decision making. When a defective area is observed, the acquisition process can be suspended and analysis performed on a composite display. This display is made of a color C-scan and a B-scan with real-time animated cross sections and a D-scan to show the profile of the tube.



Data can be recorded to RAM for online analysis, or the full tube length may be recorded to disk for offline analysis and reporting.



IRIS boiler tube inspection.

IRIS probe and corroded boiler tube.

APPENDIX FAC OPS. 6

TABLE OF MAJOR ROUTINE BUDGET COSTS – SKELDON FACTORY

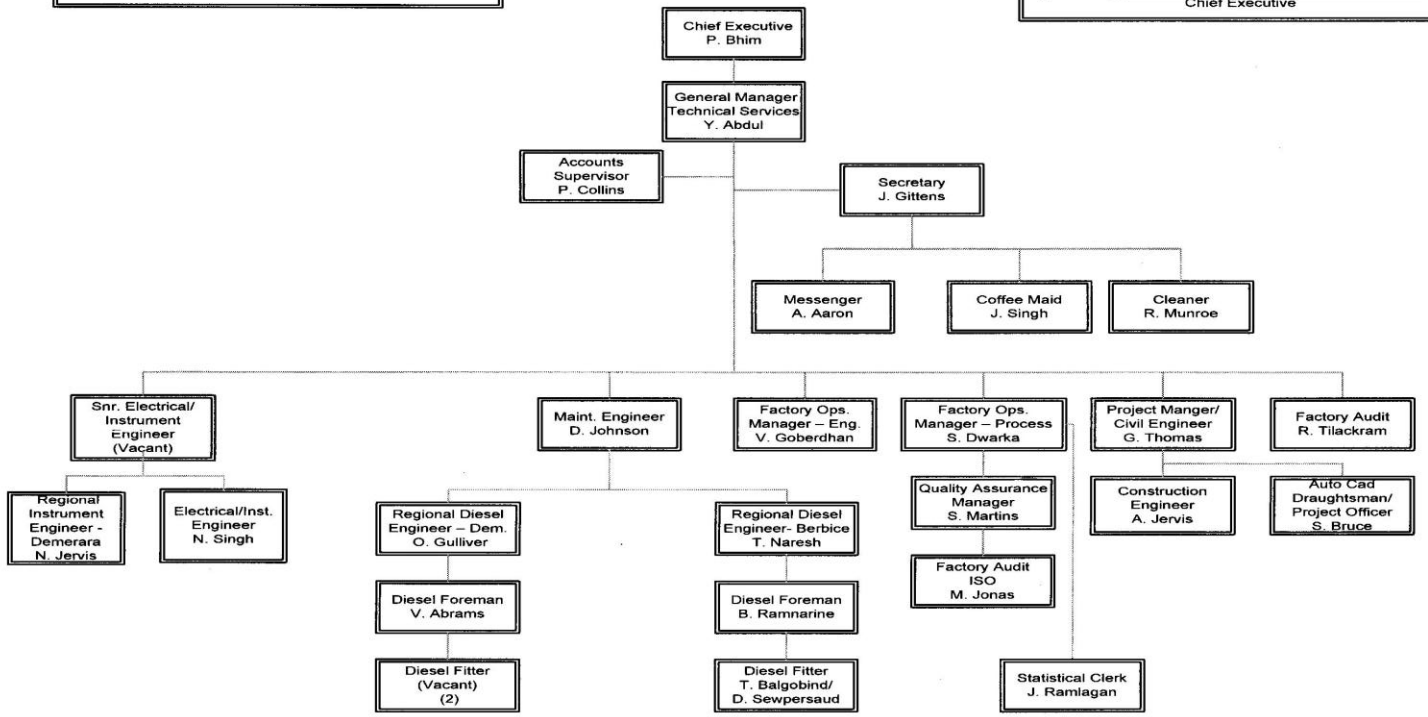
Item	2009	2010	2011	2012	2013	2014	2015
MATERIALS							
Fuel HFO (Heavy Fuel Oil)	$311,734,272.00	$711,087,570.00	$196,205,205.00	$101,675,000.00	$48,230,000.00	$153,791,000.00	$1,511,000.00
Dieselene	$90,576,046.00	$95,014,023.00	$95,524,966.00	$15,186,662.00	$5,971,533.00	$6,672,081.00	
Lubricants	$21,361,996.00	$21,468,310.00	$19,897,556.00	$25,731,674.00	$35,082,508.00		
OUTSIDE SERVICES							
Transportation Costs	$41,534,627.00	$95,376,002.00	$70,169,202.00		$63,975,459.00		
CNTIC Technical Support services rendered			$51,440,000.00				
CNTIC Technical Support services rendered			$30,561,095.00				
Consultancy/repairs Charges to No.2 boiler			$5,449,384.00				
CO-GEN COSTS							
Fuel HFO (Heavy Fuel Oil)	$60,775,768.00						
Dieselene				$6,721,672.00			
Lubricants				$11,328,931.00		$28,986,965.00	
Caustic Soda		$12,044,951.00	$1,157,384.00				
Lower Air Preheater Tubes						$10,188,674.00	$15,096,938
Repairs to #1 DG Turbocharger						$6,315,840.00	
Pivotal Shoe Radial Bearing Pad							$6,162,584
Descale Back Pressure Steam Turbine							$9,767,707
Service technicians, tools & consumables						$28,282,538.00	
TOTAL CO-GEN COSTS=						**$73,774,017.00**	

APPENDIX FAC OPS 7

Factory Operations Department

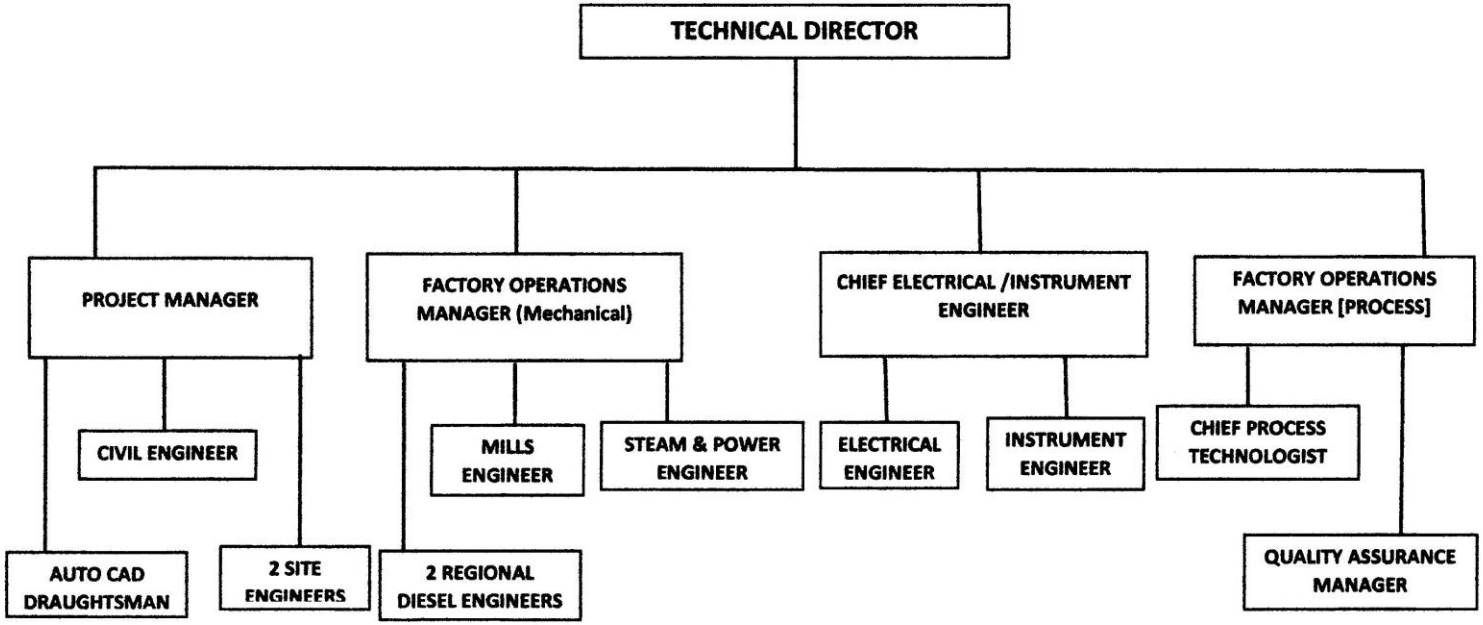
Certified by: _____
Head of Department

Approved by: _____
Chief Executive



This position of the boxes on this chart are for purposes of identifying reporting relationships only. They are not meant to portray either status or grade.

APPENDIX FAC OPS 8



APPENDIX FAC OPS 9
Priority Factory Projects
2016 - 2020

Skeldon G$ MILLION

No.	Description	2016	2017	2018	2019	2020
1.	Overhaul of diffuser gearbox.	25				
2.	Replace critical inst. for evap. and CVP.	5	5		5	5
3.	Repairs to sugar and molasses wharf.	10	20	15		
4.	Factory Workshop and Install Machinery.	20	20	15		
5.	Replace inboard dumper with winch system	100	100			
6.	Repairs to sugar drier	5	5			
7.	Replace X002 gearbox and drive.	7				
8.	Replace Bob Cat and tractor and trailer		10	15		
9.	Rotate shredder 180◦.	20				
10.	Replace scratcher structure and front end loader.		25	20		
11.	Modify infeed carrier sprockets and chain.		10	5		
12.	Replace critical pumps and drive.		10	10	10	10
13.	Install external separator to evaporator.	20	5	5		
14.	Replace air compressors		10	10		
15.	Replace lifting screws and drives on diffuser.	7	7	5		
16.	Replace mill reduction gearbox components		40	20		
17.	Improvements to roads and access way.	5	5	10	5	5
18.	Replace tubes in boiler No. 2.	100	200	200		50
19.	Replace ID fans.	10	25	15		
20.	Install feed water pumps on boilers.	20	10			20
21.	Install mud removal system.	10	5			
22.	Install seed receiver.		10	10		
23.	Replace condenser and heaters.		10	10	10	10
24.	Automation of bagasse feeding.	15	10			
25.	Replace diffuser chain components					70
	Total	**379**	**542**	**365**	**30**	**170**

Priority Factory Projects
2016 - 2020

Albion G$ MILLION

No.	Description	2016	2017	2018	2019	2020
1.	Install carding drum.		5	5		
2.	Automation of cane carrier system.	5	10	5		
3.	Mill intercarrier gearbox replacement	7	7	7		
4.	Install 1 tonne crane workshop.		5			
5.	Refurbish mills and headstocks.	10	10	10	10	
6.	Replace gantry motor and resistance bank.	10	5	5		
7.	Install punt dumper		100	100		
8.	Install evaporator.		30	30		
9.	Install vacuum pan		30	30		
10.	Upgrade clarifier		15	15		
11.	Install OC filter.		10	20		
12.	Replacement of pumps and drives	10	10	10	10	10
13.	Replace air compressor.	10	10			15
14.	Overhauls of turbine and alternator	15	15	15	15	15
15.	Upgrade of switchboard.	10	10	10		
16.	Power factor correction.	10	10	10		10
17.	Extend bagasse logie.		15	15		
18.	Upgrade No. 3 boiler.		70	20		
19.	Install boiler feed water pump.		15	15		
20.	Replacement of lab equipment.		10	10		
21.	Replace front end loader.		15			
22.	Replace mill intercarrier chain and drive				50	50
23.	Overhaul of mill turbines				15	15
24.	Repair to mill revetment civil foundation				30	20
	Total	**87**	**407**	**332**	**130**	**135**

Priority Factory Projects
2016 - 2020

Rose Hall G$ MILLION

No.	Description	2016	2017	2018	2019	2020
1.	Install punt dumpers.		100	100		
2.	Upgrade of cane prep. Equipment.		75	75		
3.	Replacement of pumps and drives.	10	10	10	10	10
4.	Refurbish milling plant.		20	20	20	20
5.	Install donnelly chute.		20	20	15	
6.	Install boiler feed pump.		10	10		
7.	Replace condensate tank		20	10		
8.	Replace ID fan.		10	10	10	10
9.	Upgrade of boilers.		150	150	75	75
10.	Install diesel gen set.	15	20	20		
11.	Replace low grade centrifugal.	20	20	10		
12.	Upgrade cane carrier system.		10	10		
13.	Replace air compressor.	7	10			10
14.	Replace front end loader.		15			
15.	Replace lab instrument.	5	5	5		
16.	Extend bagasse logie.		15	15		
17.	Repair sugar and molasses wharf.	20	20			
18.	Replace boat engine.	3				5
19.	Install crane for mill lathe.	7				
20.	Upgrade of mill turbines.		75	75		
21.	Replace condensers.		15	15	15	15
22.	Replace low grade crystallisers and drives.	20	15	15	15	15
23.	Upgrade of sugar house building.	7	7	7		
24.	Replace workshop machine.	7	7	5		
	Total	**121**	**649**	**582**	**160**	**160**

Priority Factory Projects
2016 - 2020

Blairmont G$ MILLION

No.	Description	2016	2017	2018	2019	2020
1.	Upgrade of cane prep. Equipment.		150	50		
2.	Replace mill gearing	20	20	20		20
3.	Upgrade No. 3 boiler.		40	40		
4.	Install 2.5 MW turbines and generators.		100	100		
5.	Upgrade power house switchboard.	20	20	20		20
6.	Replace pump and drives.	5	10	10	10	10
7.	Replacement of front end loader.		15			
8.	Replace centrifugal.	25	25	10		
9.	Replace mill house crane.		10	10		
10.	Replace compressors.	15	10			
11.	Install mud filter.	25	25			
12.	Replace lab equipment.	5	5	5		
13.	Mill upgrade.	20	20	20	20	
14.	Replace ID fan.	10	10			
15.	Building repairs.	7	7	7		
16.	Replace condenser.	10	10	10	10	10
17.	Extend bagasse logie		15	10		
18.	Replace mill turbines.		40	10		
19.	Replace workshop machine.	7	10	7		
	Total	**169**	**542**	**329**	**40**	**60**

Priority Factory Projects
2016 - 2020

Enmore G$ MILLION

No.	Description	2016	2017	2018	2019	2020
1.	Replace HD knife with reverse rotation - Ex LBI.	25	20			
2.	Repairs to pumps and drives.	5	10	10	10	10
3.	Mill refurbishment.	15	15	15	20	
4.	Install donnelley chute on No. 1 mill.	7			10	
5.	Upgrade of boilers.	15	10	15	15	15
6.	Replace ID fans.	15	10	10		
7.	Replace gearbox on bagasse carrier.	15	10			
8.	Replace mud filters.	15	10			
9.	Install instrumentation on evaporator.	7	7	5		
10.	Upgrade of workshop equipment.	7	5	5	5	10
11.	Replace bagasse equipment.		15			
12.	Replace heaters and condensers.	15	15	15		
13.	Upgrade of power house bus bars.	10	10	10		
14.	Replacement of drainage pumps/drives.	25	25	20		20
	Total	**176**	**162**	**105**	**60**	**55**

Priority Factory Projects
2016 - 2020

Wales G$ MILLION

No.	Description	2016	2017	2018	2019	2020
1.	Install reverse assembly and cane conveyor.		75	75		
2.	Replace gantry motor and resistance bank.		15	10		15
3.	Upgrade of building structure .	7	7	7		
4.	Replace pumps and drives.	5	10	10	10	10
5.	Upgrade of mills and gearing.	20	20	10	15	20
6.	Upgrade of power house bus bar and switches.	10	10	5		
7.	Upgrades of boilers.	50	50	50	50	
8.	Reassemble crusher drive and headstock.	15	15			
9.	Replace lab instruments.	5	5	5		
10.	Replace cane carrier control.	10	5			
11.	Replace revetment to factory.	10	10	10		
12.	Upgrade and repairs to wharf.	5	10	10		
13.	Replace condensers and juice heaters.	15	10	10	10	10
14.	Replace HG and LG baskets.	20	25	15		
15.	Replace compressors.	7	7			
16.	Replace vacuum pans.	20		20		20
17.	Replace MCC with rubber conveyor				20	20
18.	Replace Bob Cat and Bagasse equipment.		15	10		
19.	Replace No. 2 boiler chimney.	10		15		
20.	Extend bagasse logie	10	10			
21.	Replace sugar barge and tug.	30	30			30
	Total	**249**	**329**	**262**	**105**	**125**

Priority Factory Projects
2016 - 2020

Uitvlugt G$ MILLION

No.	Description	2016	2017	2018	2019	2020
1.	Upgrade of cane conveyor system.		15	15		
2.	Upgrade of leveller turbine.		30	10		
3.	Replacement of pumps and drives.	5	10	10	10	10
4.	Upgrade mill turbines.	15	25	25	25	
5.	Replace intergearing/reducer internals.	50	50	20		
6.	Upgrade of mills.	50	50	10	25	25
7.	Upgrade of boilers.	75	75	50		
8.	Replace boiler chimney.	20	15			
9.	Replace ID fans.	7	7			
10.	Replace lab instruments.	5	5	5		
11.	Replace bagasse equipment.		15			
12.	Replace workshop equipment.	5	5	5		
13.	Building upgrade.		10	5		15
14.	Install molasses tank.	20	10			
15.	Replace juice heaters	15	10	10		10
16.	Replace bagasse carrier gearbox.	7	7			
17.	Replace condensers.	15	10	10	10	10
18.	Replace centrifugals.	20	20	20		
19.	Install syrup clarifier.	10				10
20.	Replace revetment to factory.	10	10			
21.	Power factor correction.	7	7	7		
	Total	**336**	**386**	**202**	**70**	**80**

Cogeneration Plant 5 Years Projection

G$ MILLION

No.	Description	2016	2017	2018	2019	2020
1	Replace scratcher structure and front end loader.		25	20		
2	Replace air compressors		10	10		
3	Replace tubes in boiler No. 2.	100	200	200	50	75
4	Replace ID fans.	10	25	15		
5	Install feed water pumps on boilers.	20	10			25
6	Automation of bagasse feeding.	15	10			
	Total	**145**	**280**	**245**	**50**	**100**