Stantec

Stantec Consulting Ltd.
70 Southgate Drive, Suite 1, Guelph ON N1G 4P5

April 17, 2015
File: 160930286

Attention: Mr. Pat Devlin
City of Peterborough
500 George Street North
Peterborough ON K9H 3R9

Dear Mr. Devlin,

Reference: Capital & Operating Cost Evaluation for LYSTEK and ANDRITZ Biosolids Processing Systems – RFP – 28 -14; T-29-15 Merchant Capacity for Biosolids Management Services

Please find the attached memo that details the capital and operating cost evaluation for each of LYSTEK and ANDRITZ in-situ biosolids processing options in accordance with RFP 28-14. The review and evaluation provided in the memo does not reflect all of the criteria outlined in the RFP for the onsite system analysis as it was only intended to focus on component; system costs.

The results of the five (5) independent reviewer evaluations of the two in-situ options for all criteria are also attached. Very generally, both systems scored quite favourably with respect to all criteria with ANDRITZ more notably favoured on end product quality and marketability but LYSTEK more favourable with respect to price. All in all the LYSTEK system was favoured somewhat more than ANDRITZ largely because cost accounted for 25% of the overall score.

While the capital cost for the ANDRITZ system is almost twice that of the LYSTEK system, the nature of the end product and the lack of chemical cost results in the annual O&M for the ANDRITZ system to be about 40% lower than the annual O&M cost for the LYSTEK system. On an overall annualized basis at a bond rate of 3.5% the lower capital cost of the LYSTEK system however, makes it the lowest overall cost when these two in-situ management options are compared.

Concurrent to the RFP – 28 – 14 process the City let out a separate Tender T-29-15 for third party offsite processing and beneficial end use of their biosolids. The tender called for five years of service with an option for an additional five years. Third High Farms (the City's current service provider) was the lowest compliant bidder with a price of $91.75 per wet tonne with an escalation rate tied to the Consumer Price Index for all costs and for transportation for Ontario.

When the in-situ options are compared to the third-party offsite processing option (on a dry tonne basis for comparability) the third party, or merchant capacity option over a ten (10) year period the ten (10) year cost is in the order of $8,839,000 compared to $11,149,0000 for LYSTEK and $12,732,000 for ANDRITZ. Third High Farms presents the lowest cost option and has provided consistent, reliable service to the City and applied the City's biosolids to beneficial end use for the last six years.

Reference: Capital & Operating Cost Evaluation for LYSTEK and ANDRITZ Biosolids Processing Systems – RFP – 28 -14; T-29-15 Merchant Capacity for Biosolids Management Services

Two items can have a significant bearing on the relative costs of these options. The solids content achieved in dewatering will of course have a significant impact on the merchant facility pricing however the City has consistently achieved @25% solids content and so can reasonably anticipate the same throughout the duration of a merchant capacity contract. The bond rate will impact the relative cost over the life for the onsite options. The rate used in this analysis was 3.5%. At lower rates the long term cost of operation for the ANDRITZ dryer become more favorable than the LYSTEK system due to lower O&M costs.

Based on the analysis it appears that the best short-term option for the City would be the continued use of Third High Farms as their service provider however given uncertainties in factors like population growth it is recommended that the City reconsider the in-situ options e.g. in 4 to 5 years as there may be a 'tipping point' where the in-situ option becomes the preferred option for the City.

Regards,

STANTEC CONSULTING LTD.

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Attachment: Memo – Capital and Operating Cost Evaluation, Evaluation Results Table for In-Situ Options

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Stantec

Memo

To:	Mr. Pat Devlin	From:	Charlie Alix
	City of Peterborough		Stantec Consulting Ltd
File:	160930267	Date:	April 17, 2015

Reference: **Capital & Operating Cost Evaluation for LYSTEK and ANDRITZ Biosolids Processing Systems – RFP – 28 -14; T-29-15 Merchant Capacity for Biosolids Management Services**

LYSTEK

PROCESS DESCRIPTION

The Lystek process is a combination of alkaline stabilization with mechanical and heat induced lysis. Biosolids dewatered to between 135 to 175 solids come from the dewatering operation and are stored in a surge hopper. Lystek is proposing two 20m3 hoppers. From the hoppers the biosolids are pumped into the Lystek reactor vessel. The vessel is a plug flow tank in which the biosolids are mixed with steam, alkali, most commonly in the form of potassium hydroxide, and WWTP effluent. The potassium hydroxide increases the pH of the material to 11. The steam is low pressure steam and increases the temperature of the mixture to 70°C. Residence time in the reactor at this temperature is a minimum of 30 minutes. This time and temperature combination is required to achieve pasteurization of the biosolids. The high pH also contributes to pasteurization.

Within the vessel the material are blended by a high shear mixer. The combination of pH, high shear mixing and heat lyses the material changing the rheology of the material so that the end product at 16% solids is flowable as a viscous liquid as opposed to the cake consistency of the dewatered biosolids. The complete process occurs within the reactor vessel. The end product exits the vessel and is stored in a tank.

Table 1 below provides a simplified mass for weekly operations of the Lystek system under current biosolids production.

Table 1 Lystek weekly mass balance

Material	Dry Tonnes	Wet Tonnes	Solids
Biosolids	33.7	192.3	17.5%
Alkali		3.7	
Steam		9.6	
Effluent		4.7	
Blowdown		1.0	
Process Ammonia		0.002	
Storage Ammonia		0.009	
Product	33.7	209.4	16.1%

Reference: Capital & Operating Cost Evaluation for LYSTEK and ANDRITZ Biosolids Processing Systems – RFP – 28 -14; T-29-15 Merchant Capacity for Biosolids Management Services

EMISSIONS & ODOURS

The process is mostly enclosed so there is limited opportunity for odours to escape. However, the emissions that are released are odourous and must be treated. The addition of alkali material and subsequent elevation in pH causes release of significant amounts of ammonia. Ammonia is both odourous and its presence interferes with the effectiveness of most odor control systems. For these reasons an air treatment step targeting the ammonia specifically is required. This will need to be an acid wet scrubber. After ammonia treatment the material still retain odours from reduced sulfur compounds and volatile organic compounds. Because the material has been pasteurized this is less than simply dewatered biosolids but still significant enough to require treatment. For treatment of the remaining odours Stantec recommends activated carbon filtration. This method is both highly effective and requires a small footprint which is important at the Peterborough facility. An in-line heater will be needed between the ammonia scrubber and carbon filter to reduce the percent moisture of the air. This will improve the performance of the carbon filter. The fans sending air to the carbon filter will be located indoors and therefore will need to be wired Class 1 Division.

In addition to the treated air a roof ventilation fan should be provided to ventilate heat out of the building in hot weather.

BUILDING

As part of the submittal the proponent provided a building layout for the proposed system. Lystek proposed a building 11m x 17m by 7.5m high. After reviewing the layout we felt the proposed configuration was insufficient for full maintenance access to the equipment. Therefore we developed an alternative layout that that requires a 11m x 22m x 10m high building. A plan of the revised layout is shown in **Figure 1**. The financial review of the system is based on the construction of the larger structure.

PRODUCT

The end product is a viscous liquid with solids content of 16%. It has a mostly ammonia odour that it will retain for several months. The product is used as a soil amendment on agricultural fields. The product is injected into the soil with specialized application equipment. It can be surface applied but this is not currently done and has potential odour issues. In addition there is a very limited amount of time each year when surface application can be practiced. The use of this equipment is not common to all farming operations but based on the current customer list provided by Lystek there are companies or farmers that provide the subsurface injection as a service to area farms. Since the end use is agricultural fields it is limited mostly to the spring and some summer months. Long term storage of the end product off site of the WWTP is essential.

In their proposal Lystek provided list of farmers in Ontario interested is using the product and also those that had the ability to store the material on their farms. They received interest in farms with 8,300 m^3 of available storage for the 12,000 to 17,000 m^3 needed each year. In addition they received letters of interest from farmers with 3,400 acres under cultivation of the estimated 1,200 to 1,300 acres needed annually.

Lystek also provided an extra to the proposal to manage and market all the product produced by Peterborough. It is worth noting that at least currently there is no other market for this end product.

Reference: Capital & Operating Cost Evaluation for LYSTEK and ANDRITZ Biosolids Processing Systems – RFP – 28 -14; T-29-15 Merchant Capacity for Biosolids Management Services

COSTS

As noted earlier the proposed building did not provide adequate maintenance access to the equipment and thus the building was reconfigured and enlarged. This is reflected in a new opinion of capital cost presented in **Table 2** Below:

Table 2 Opinion of probable capital cost for the Lystek system

Item	Unit Cost	Unit	Quanitity	Cost
Paving	$ 30.00	yd^2	358.8	$ 10,764
Building	$ 10.70	ft^3	85,461.6	$ 914,439
Utilities				$ -
Lystec system	$ 3,070,000.00	ls	1.0	$ 3,070,000
Installation	$ 3,900.00	ton	30.0	$ 117,000
Storage tanks foundation	$ 2,000.00	yd^3	188.3	$ 376,690
Storage tank installation	$ 3,900.00	ton	10.0	$ 39,000
Bridge crane	$ 58,000.00	ea	1.0	$ 58,000
Odor control system				
Ammonia scrubber	$ 40,000.00	ea	1.0	$ 40,000
Fan	$ 15,000.00	ea	1.0	$ 15,000
Duct work	$ 100.00	ft	250.0	$ 25,000
Carbon filter	$ 50,000.00	ea	1.0	$ 50,000
Filters	$ 20,000.00	ls	1.0	$ 20,000
Installation	$ 30,000.00	ls	1.0	$ 30,000
Stack	$ 300.00	ft	30.0	$ 9,000
HST				$ -
Subtotal				$ 4,775,000
Bonding	8.0%			$ 382,000
Contractor O&P	25.0%			$ 1,289,250
Engineering & permitting	10.0%			$ 644,625
Contingency & Escalation	20.0%			$ 1,418,175
Project Total				$ 8,510,000

Reference: Capital & Operating Cost Evaluation for LYSTEK and ANDRITZ Biosolids Processing Systems – RFP – 28 -14; T-29-15 Merchant Capacity for Biosolids Management Services

In **Table 3** below is the opinion of the annual O&M cost for operations at the current biosolids production for the facility. The following assumptions were used in developing the O&M cost; one full time equivalent is need for half of the system operating time. It is assumed this worker will split time between the system operation and other duties such as dewatering, etc. A reduction in the cost of polymer used is accounted for with the solids content of the biosolids entering the Lystek process reduced to 17% from the current 20% to 25%. The cost for marketing of the end product is derived directly from the proposed marketing service offered by Lystek.

Table 3 Annual Lystek O&M cost at 2015 biosolids production levels

Item	Unit Cost	Unit	Quanitity	Cost
Employees	$ 78,374.40	FTE	0.8	$ 61,804
Gas	$ 0.40	m^3	26,250.0	$ 10,500
Electricity				
Continuous	$ 0.12	kwhr	525,600.0	$ 63,072
Intermitant	$ 0.12	kwhr	339,430.0	$ 40,732
Alkali	$ 0.75	kg	193,000.0	$ 144,750
Equipment maintenance	1%			$ 30,700
Water				
Dewatering polymer	reduction from current			$ (100,000)
Building heating				$ 10,000
Marketing	$ 9.75	wet tonne	10,887.4	$ 106,152
Product shipping				$ -
Renevue				$ -
Total				$ 367,710

ANDRITZ

PROCESS DESCRIPTION

Biosolids are dewatered in the existing centrifuges and is transported to a 25 cubic meter live bottom storage hopper via a screw conveyor. Beneath the storage hopper are two sludge pumps, one duty and one standby. The pumps send the biosolids to a mixer where the wet biosolids are blended with some of the dried product. The blended material from the mixer has a solids content of 70%. This blended material goes to the rotary dryer were the solids content is increases to 93%. The target solids content is 90% with the additional 3% providing a safety factor.

The biosolids and moisture laden air from dryer is sent to a pre-separator. The larger particle size biosolids go out the bottom of the pre-separator and are discharged to a roller mill to be crushed and returned to the mixer upstream of the dryer.

The smaller fraction goes to a screen. The appropriately sized particles fall out of the bottom of the screen and go to a pellet cooler and from there to final product storage. The larger sized material goes to the roller mill.

Reference: Capital & Operating Cost Evaluation for LYSTEK and ANDRITZ Biosolids Processing Systems – RFP – 28 -14; T-29-15 Merchant Capacity for Biosolids Management Services

The moisture laden air from the pre-separator goes to a cyclone to remove small particles of biosolids. The small particles go to the sizing screen. The air is carrying the moisture evaporated from the biosolids. This air goes to a condenser where the air is cooled and the moisture comes out of the air. The moisture goes back to the WWTP while the air goes on to odour control.

There is a 150 cubic meter product storage silo. The silo is elevated so that trucks can drive under it and be loaded with the product. There is a dust collecting baghouse to remove dust from the storage silo. The air released from the baghouse will be sent to odour control. There is a nitrogen tank associated with the storage silo as well. The nitrogen displaces air in the silo if the temperature in the silo rises.

Table 4 provides a weekly materials balance for the Andritz process at the current biosolids production levels.

Table 4 Andritz weekly mass balance

Material	Dry Tonnes	Wet Tonnes	Solids
Biosolids	33.7	168.3	20.0%
Cooling water		1,753.7	
Blowdown		1,753.7	
Product	30.1	32.8	92.0%
Waste	3.52	3.82	92.0%

EMISSIONS AND ODOURS

Air from the following processes downstream of the dryer will need to pass through a wet scrubber to remove solids:

- Pre-separator
- All conveyors (screw and bucket elevators)
- Sizing screen
- Pellet cooler and pneumatic conveyor

After the solids removal this air will pass through an acid scrubber to remove ammonia. This air will require further treatment to meet strict regulatory odour limits.

Other air sources that will also require treatment include the partial exhaust from the condenser and exhaust from the product storage silo baghouse. Most of the air from the condenser is returned to the furnace as combustion air but the combustion air demand is less than the condenser exhaust.

An activated carbon filter will be needed as the polishing step for all of the air to be treated. The combination of the air from the ammonia scrubber and from the baghouse should have a moisture content of about 60%. A preheater upstream of the carbon filter should not be needed for this system. The exhaust fan feeding the carbon filter will be located indoors and therefore the motor will need to be wired Class 1 Division 1.

In addition to the treated air a roof ventilation fan should be provided to ventilate heat out of the building in hot weather.

BUILDING

As part of the submittal the proponent provided a building layout for the proposed system. Andritz proposed an L shaped building with the main process areas sized at 11m x 17m by 11.4m high with a truck bay 6m x 15 m x 11.4 high. After reviewing the layout we felt the proposed configuration of the process area was insufficient for full maintenance access to the equipment. Therefore we developed an alternative layout for the process area of 11m x 27m x 11.4m high. The truck bay remains the same A plan of the revised layout is shown in **Figure 2**. The financial review of the system is based on the construction of the larger structure.

PRODUCT

The end product is a light weight pellet with a granule size of 0.5 to 4 mm. This size is the same as chemical fertilizer and thus the pellets can be spread using standard farm and lawn care equipment. The product has been used throughout North America as both an agricultural fertilizer and for use by the general public. The product is dry (90%+ solids content) loose and granular. It is easy to handle, store and transport. It is very low odour but will develop odors when rewetted. For farmers or others storing the product it need only be kept dry.

The material is combustible and is sometimes used as fuel in cement kilns and power plants. For this reason the temperature of any large stockpiles of the material should be monitored. Deep and dense piles pose a spontaneous combustion risk if left unattended for several months.

Currently there are two sources of biosolids pellets in Ontario, The Ashbridges Bay WWTP in Toronto and the WWTP in Windsor. The pellets from Toronto are used as fuel by Veolia. The Windsor pellets are sold in bulk to farmers for $19/tonne. The City would need to market the product sufficiently to keep a low inventory or contract with a broker.

COSTS

As noted earlier the proposed building did not provide adequate maintenance access to the equipment and thus the building was reconfigured and enlarged. This is reflected in a new opinion of capital cost presented in **Table 5** Below:

In **Table 6** below is the opinion of the annual O&M cost for operations at the current biosolids production for the facility. The following assumptions were used in developing the O&M cost; one full time equivalent is need for half of the system operating time. It is assumed this worker will split time between the system operation and other duties such as dewatering, etc. The City will sell the material wholesale to farmers or a broker who will pick up the material. This assumption is based on

the similar practice for marketing the pellets produced by Windsor, ON. One day per week for a management level employee is assumed for marketing. The initial time will be more, however, given the City's past experience at marketing land applied biosolids to farmers the actual ongoing time assumption is reasonable.

Table 5 Opinion of probable capital cost for the Andritz system

Item	Unit Cost	Unit	Quanitity	Cost
Paving	$ 30.00	yd^2	200.0	$ 6,000
Building	$ 10.70	ft^3	154,142.0	$ 1,649,319
Utilities				$ -
Andritz system	$ 6,869,410.00	ls	1.0	$ 6,869,410
Installation	$ 3,900.00	ton	50.0	$ 195,000
Bridge crane	$ 58,000.00	ea	1.0	$ 58,000
Odor control system				
Ammonia scrubber	$ 40,000.00	ea	1.0	$ 40,000
Fan	$ 15,000.00	ea	1.0	$ 15,000
Duct work	$ 100.00	ft	250.0	$ 25,000
Carbon filter	$ 50,000.00	ea	1.0	$ 50,000
Filters	$ 20,000.00	ls	1.0	$ 20,000
Installation	$ 30,000.00	ls	1.0	$ 30,000
Stack	$ 300.00	ft	30.0	$ 9,000
HST				$ -
Subtotal				$ 8,967,000
Bonding	8.0%			$ 717,360
Contractor O&P	25.0%			$ 2,421,090
Engineering & permitting	10.0%			$ 1,210,545
Contingency & Escalation	20.0%			$ 2,663,199
Project Total				$ 15,980,000

Reference: Capital & Operating Cost Evaluation for LYSTEK and ANDRITZ Biosolids Processing Systems – RFP – 28 -14; T-29-15 Merchant Capacity for Biosolids Management Services

Table 6 Annual Andritz O&M cost at 2015 biosolids production levels

Item	Unit Cost	Unit	Quanitity	Cost
Employees	$ 78,374.40	FTE	0.8	$ 63,040
Gas	$ 0.40	m^3	9,168.8	$ 3,668
Electricity				
Continuous	$ 0.12	kwhr	525,600.0	$ 63,072
Intermitant	$ 0.12	kwhr	344,933.6	$ 41,392
Equipment maintenance	1%			$ 68,694
Water				
Building heating				$ -
Marketing	$ 108,781.40	FTE	0.2	$ 21,756
Product shipping				$ -
Renevue	$ 19.00	tonne	1,703.4	$ (32,365)
Total				$ 229,257

COST COMPARISON

The cost comparison of the two systems is based on an annualized one year cost to operate with capital cost distributed over 20 years. The systems are compared on a cost per dry tonne to operate with the 1,750 dry tonnes of 2015 as the annual biosolids production. **Table 7** lists the comparison costs for the two systems.

Table 7 Cost summary

Annualized Cost		
Cost	Lystek	Andritz
Capital	$ 8,510,000	$ 15,980,000
Years	20	20
Interest Rate	3.5%	3.5%
Annualized Capital	$ 598,773	$ 1,124,370
O&M	$ 367,710	$ 229,257
Annualized Cost	$ 966,483	$ 1,353,627
Cost /dry tonne		
O&M	$ 210.12	$ 131.00
Annualized Capital	$ 342.16	$ 642.50
Total	$ 552.28	$ 773.50

Reference: Capital & Operating Cost Evaluation for LYSTEK and ANDRITZ Biosolids Processing Systems – RFP – 28 -14; T-29-15 Merchant Capacity for Biosolids Management Services

The capital cost for the Andritz system is almost twice that of the Lystek system. The nature of the end product and the lack of chemical cost results in the annual O&M for the Andritz system to be about 40% lower than the annual O&M cost for the Lystek system. On an overall annualized basis at a bond rate of 3.5% the lower capital cost of the Lystek system however, makes it the lowest overall cost when these two in-situ management options are compared.

Currently the City uses a commercial third party facility for biosolids processing, Third High Farms. The current contract with Third High Farms is expiring and services would be needed during the development of an onsite processing system. Concurrently with requests from Andritz and Lystek the City let out a separate Tender T-29-15 for third party offsite processing and beneficial reuse of their biosolids. THE RFP was for five years of service with an option for an additional five years. Third High Farms was the lowest compliant bidder with a price of $91.75 per wet tonne with an escalation rate tied to the Consumer Price Index for all costs and for transportation for Ontario.

Third High Farms has been utilizing the Lystek process since 2013 to process biosolids and land apply the product on farmland. They operate two trucks of their own and likely contract with other truckers as needed.

Table 8 below shows the comparative costs for operating an onsite system and the Third High Farm proposal. It should be noted that only 10 years are examined since there are sludge production figures for only the next 10 years and the merchant facility pricing is only valid for 10 years. However, the onsite system options will be operational for at least 20 years. The cost for the merchant capacity option is based on 25% solids. As noted above the merchant capacity cost is on a wet tonne basis but the comparison in **table 8** is on a dry tonne basis. Also for **Table 8** an annual escalation for the merchant facility option of 2% was assumed. This is higher than recent CPI increases but given the current low fuel costs and the potential for rapid escalation in the energy market it was felt to be a reasonable assumption.

Table 8 Comparative cost of ten years of operation

Year	Biosolids	Merchant Facility		On Site Processing	
	Dry Tonnes/yr	Cost	@25% Solids	Lystek	Andritz
2015	1750	$ 91.75	$ 642,250	$ 966,483	$ 1,353,627
2016	1825	$ 93.59	$ 683,171	$ 982,242	$ 1,136,630
2017	1900	$ 95.46	$ 725,471	$ 998,000	$ 1,136,875
2018	2000	$ 97.37	$ 778,927	$ 1,019,012	$ 1,137,125
2019	2009	$ 99.31	$ 798,080	$ 1,020,904	$ 1,137,380
2020	2018	$ 101.30	$ 817,689	$ 1,022,795	$ 1,137,641
2021	2027	$ 103.33	$ 837,762	$ 1,024,686	$ 1,137,906
2022	2035	$ 105.39	$ 857,890	$ 1,026,367	$ 1,138,177
2023	2044	$ 107.50	$ 878,918	$ 1,028,258	$ 1,138,453
2024	2053	$ 109.65	$ 900,444	$ 1,030,149	$ 1,138,735
2025	2053	$ 111.84	$ 918,453	$ 1,030,149	$ 1,139,022
Total Cost			$ 8,839,054	$ 11,149,043	$ 12,731,571

Reference: Capital & Operating Cost Evaluation for LYSTEK and ANDRITZ Biosolids Processing Systems – RFP – 28 -14; T-29-15 Merchant Capacity for Biosolids Management Services

Two items can have a significant bearing on the relative costs of these options. The solids content achieved in dewatering will of course have a significant impact on the merchant facility pricing however the City has consistently achieved @25% solids content and so can reasonably anticipate the same throughout the duration of a merchant capacity contract. The bond rate will impact the relative cost over the life for the onsite options. The rate used in this analysis was 3.5%. At lower rates the long term cost of operation for the Andritz dryer become more favorable than the Lystek system due to lower O&M costs.

This review and evaluation does not reflect all of the criteria outlined in the RFP for the onsite system analysis as it was only intended to focus on component; system costs.

STANTEC CONSULTING LTD.

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Project Manager
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Attachment: Figures 1 and 2

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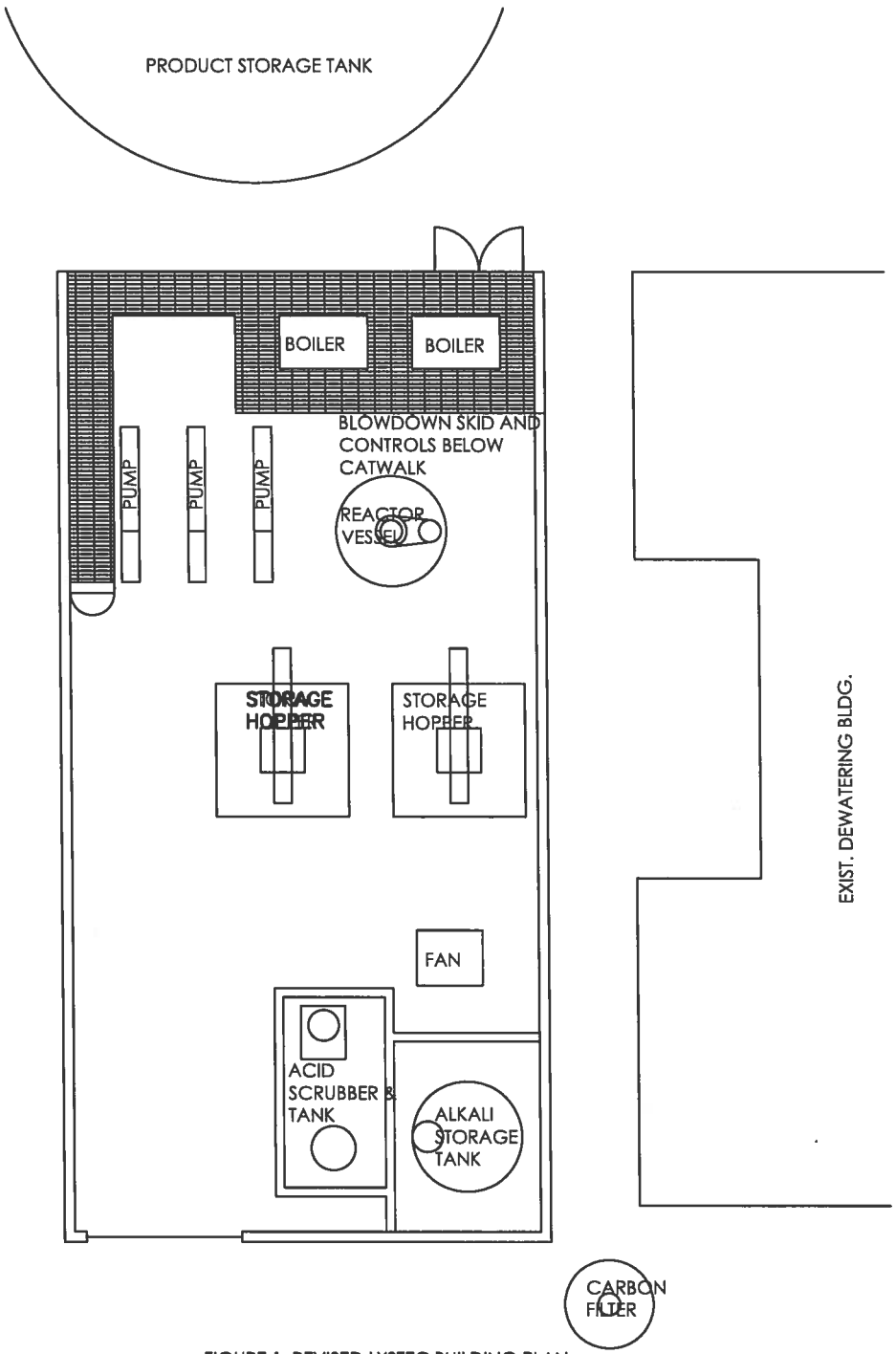

FIGURE 1: REVISED LYSTEC BUILDING PLAN
SCALE: 1: 4

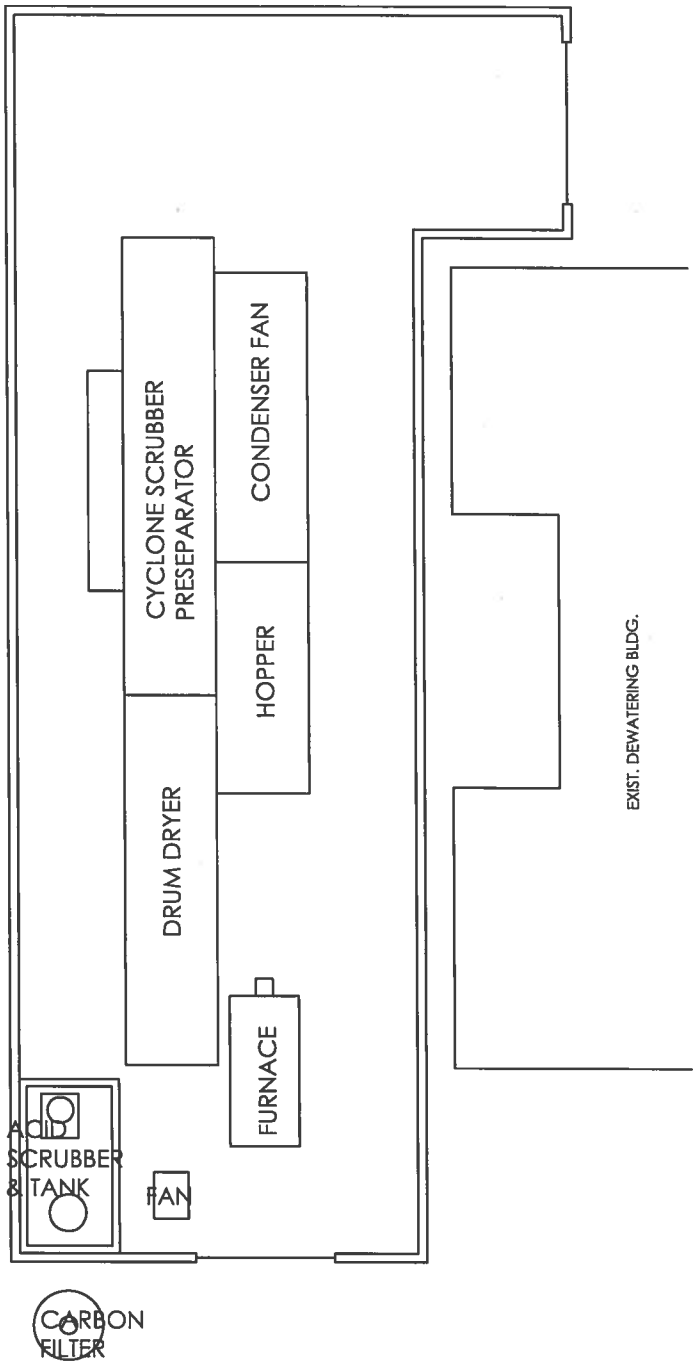

FIGURE 2: REVISED ANDRITZ BUILDING PLAN
SCALE: 3/4" = 1'-0"

P-28-14 Combined Average Scores

		Lystek International Inc											Andritz									
	Component	Factor Weight	Evaluator 1		Evaluator 2		Evaluator 3		Evaluator 4		Evaluator 5		Factor Weight	Evaluator 1		Evaluator 2		Evaluator 3		Evaluator 4		Evaluator 5	
			Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score		Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score
1	Proponent Information and Financial Capabilities – Item 5.10.2, Item 5.10.5	5	0.8	4	0.9	4.5	0.8	4	0.9	4.5	0.8	4	5	0.8	4	0.8	4	0.9	4.5	0.8	4	0.8	4
2	Ease of Maintenance - Attachment 4, 1.5, a, d, f, h, j, Attachment 5, Attachment 5, 1.5, a, d, f, h, j.	10	0.8	8	0.9	9	0.8	8	0.9	9	0.8	8	10	0.6	6	0.6	6	0.7	7	0.6	6	0.7	7
3	Compatibility of Instrumentation and Controls – Item 5.10.6,Attachment 4, 1.5, g, Attachment 5, Attachment 5, 1.5, g	5	0.8	4	0.8	4	0.8	4	0.8	4	0.8	4	5	0.7	3.5	0.9	4.5	0.8	4	0.8	4	0.8	4
5	Ease of Operation/Staffing Requirements – Attachment 4, 1.5, a, b, c, d, e, l Attachment 5, 1.5, , a, b, c, d, e, l	15	0.8	12	0.9	13.5	0.9	13.5	0.9	13.5	0.9	13.5	15	0.7	10.5	0.7	10.5	0.6	9	0.7	10.5	0.7	10.5
6	End Product Quality and Marketability – Item 5.10.8, Attachment 4, 1.5, j, k, Attachment 5, 1.5, j, k	15	0.8	12	0.6	9	0.8	12	0.6	9	0.7	10.5	15	0.8	12	1	15	0.9	13.5	1	15	1	15
7	Health and Safety – Item 5.10.7	10	0.8	8	0.8	8	0.7	7	0.8	8	0.8	8	10	0.7	7	0.7	7	0.7	7	0.6	6	0.7	7
8	Ability to Achieve Environmental Compliance – Item 5.10.8 Attachment 4 1.5, j, k Attachment 5 1.5, j, k.	5	0.8	4	0.8	4	0.8	4	0.8	4	0.8	4	5	0.7	3.5	0.8	4	0.8	4	1	5	0.9	4.5
10	Reliability – Appendix D Attachment 4 1.5, f, h Attachment 5 1.5, f,h.	10	0.8	8	0.8	8	0.8	8	0.8	8	0.8	8	10	0.7	7	0.8	8	0.8	8	0.7	7	0.8	8
11	Life Cycle Cost – Item 5.10.1, Appendix C, Item 8.6	25	0.8	20	0.8	20	0.8	20	0.8	20	0.8	20	25	0.6	15	0.6	15	0.6	15	0.6	15	0.6	15
	TOTAL	100		80		80		80.5		80		80	100		68.5		74		72		72.5		75
	TOTAL AVERAGE SCORE		80.1											72.4									

NOTE: ranking of each component was on a 1-5 basis and the associated allocated percentage e.g. 4 of 5 = 80% was allocated to the factor weight to get the final score for each component