Title

The Green Value Engineering Methodology: a sustainabil-ity-driven project management tool for capital projects in pro-cess industry

Description

Supporting information:Attachment B. Proposals assessment scores

The following table contains a selection* of the 80+ proposals of improvement that were collected during several brain-storming sessions between VTU engineering Technical Team and the Client Management, aimed at improving project economics and the perspective plant green performances. The score given during the first and second assessment determined the acceptance to further engineering or the rejection. The minimal score to pass the first assessment is 10 points, the second 11 points, as agreed with the Project Governance. Marked in green the proposals that were accepted to be implemented. *The omitted options could not be disclosed for confidentiality reasons.

ID	Improvement Proposal Description	FIRST ASSESSMENT				SECOND ASSESSMENT				
		Green Impact	Economic Potential	Design Maturity	SCORE	Impact Capex	Implementation ease	Project Risk	Impact Schedule	SCORE
1	Employ an external storage facility and transport the goods at the site as per daily need	3	2	5	**10**	2	1	2	4	**9**
2	Evaluate a continuous process for waste water treatment (halogen removal) vs batch one.	4	4	2	**10**	1	2	1	2	**6**
3	Hot Condensates Recovery: pre-cool condensates before discharging it in the cooling tower pit as evaporation makeup.	4	4	3	**11**	1	2	4	4	11
4	Hot Condensates Recovery. Use condensates to heat a reaction step	4	3	2	**9**	Not assessed				
5	Hot Condensates Recovery. Install low boiling fluid turbines to produce electricity (Trigeneration)	3	1	2	**6**	Not assessed				
6	Hot Condensates Recovery: Heat recovery with standardized thermal levels (e.g. 115°,90°,65°C).	3	3	1	**7**	Not assessed				
7	Hot Condensates Recovery. Alternative 5, use low grade heat for AHU of the future warehouse	4	3	4	**11**	1	3	4	4	12
8	Check the Compressors utilization management (On/Off machines and Inverter). Verify the implementation of an automatic software system to maximize utilization.	4	1	2	**7**	Not assessed				
9	Verify if the allowable pressure level for Compressed air (6barg) can be lowered.	3	2	1	**6**	Not assessed				
Omissis										
14	Distributed phasing for large electricity utilizers (>100kW) to have lower section cables (Cable downsizing)	3	3	4	**10**	1	4	4	4	13
15	Evaluate a stripping column for solvent recovery from one of the waste streams.	2	1	1	**4**	Not assessed				
16	Circular utilization of non-reacted ingredients: evaluate the composition differences between fresh and waste to install a purification plant.	3	2	1	**6**	Not assessed				
17	Assess possibility to enhance solvent recovery from wastewater streams with membranes	4	1	1	**6**	Not assessed				
18	Critically assess installation typical schemes (sanitary valves- ball vs membrane)	3	2	5	**10**	1	4	4	2	**11**
19	Buy an independent thermal regulation system for the drier to exploit low grade heat from other sources in the plant.	4	3	3	**10**	3	2	1	2	**8**
20	Avoid ice formation on chillers, as performances are getting lower.	3	3	2	**8**	Not assessed				
21	Use electrical and automated system (AGV) for product bins displacement.	2	1	4	**7**	Not assessed				
22	Reuse of existing equipment, after compatibility check of materials and process (Tank Reuse)	5	4	4	**13**	2	3	4	4	**13**
Omissis										
26	Recovery of Rain water for irrigation, sewage (dual network) other uses.	4	2	4	**10**	1	1	3	2	**7**
27	Consider installation of improved energy class electrical motors with respect to the site standard.	4	3	5	**12**	1	4	4	4	**13**
28	Civil hydraulic system: high efficiency aerators on the taps.	2	1	5	**8**	Not assessed				
29	Assess different solutions for the cables and tubing channels (strength/cost/environmental.impact)	2	1	3	**6**	Not assessed				
30	Critically assess the noble materials for instrumentation (site standard: higher than pipe class for durability!)	2	2	3	**7**	Not assessed				
31	Use of Aluminium Vs Copper for medium tension distribution and bar (bigger size, lower weight an price)	3	4	5	**12**	3	3	4	4	**14**
32	Illumination based on scenarios from one Led supplier- assess other vendors.	2	3	3	**8**	Not assessed				
33	Energy/resources monitoring system based on data taken from DCS. Possibility to have redundant dedicated sensors for equip. subject to white certificate emission.	3	1	4	**8**	Not assessed				
34	Energy/resources monitoring system, implement machine learning software to develop management strategies to maximize utilization and reduce impacts.	4	4	2	**10**	3	3	1	2	**9**
Omissis										
39	Solar energy generation with panels on rooftops with enhanced design of the roofs	5	3	5	**13**	1	3	4	3	**11**
40	Use of green roofs, reflecting coating and grey sheets to reflect irradiated light on roofs	3	1	3	**7**	Not assessed				
Omissis										
60	Natural illumination when possible	3	3	2	**8**	Not assessed				
61	Installation of a cogeneration combustion plant	3	1	1	**5**	Not assessed				
62	Plant trees on free soil and areas at the border (carbon capture and sound barrier)	2	1	2	**5**	Not assessed				
63	Utilize Plate and frame heat exchanger instead of shell and tube when possible.	3	1	3	**7**	Not assessed				
64	Revise the SiC heat exchangers, as less noble materials may be compliant.	4	3	2	**9**	Not assessed				
Omissis										
70	Selection of construction materials with high scores on CAM protocols	4	3	5	**12**	1	4	1	1	**7**
71	BIM design to enhance constructability of the site	2	2	4	**8**	Not assessed				
72	Modular design and easy expandability of the plants in case of future increase of production.	2	2	3	**7**	Not assessed				
Omissis										
77	Share vacuum pumps to different circuits	3	4	3	**10**	1	1	1	3	**6**
78	Increase piping insulation to reduce wasted heat	4	2	4	**10**	1	1	3	2	**7**
79	Magnetic driven motors for compressors	4	3	3	**10**	1	4	2	4	**11**
81	Closed loop evaporation towers to reduce water consumption	4	3	3	**10**	1	2	1	3	**7**
82	Vendor list extension, qualification of new procurement sources	3	5	2	**10**	4	3	2	4	**13**