Master's Thesis Engineering Technology

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Creating an energy source for Mali Muleba

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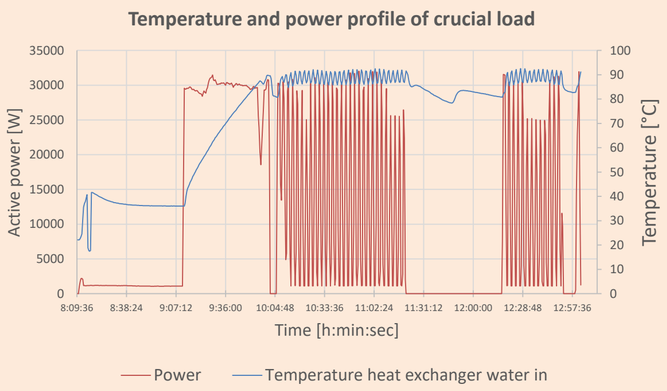
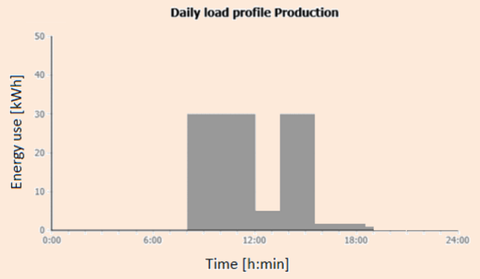
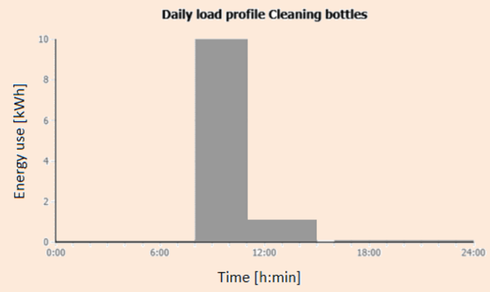
Problem

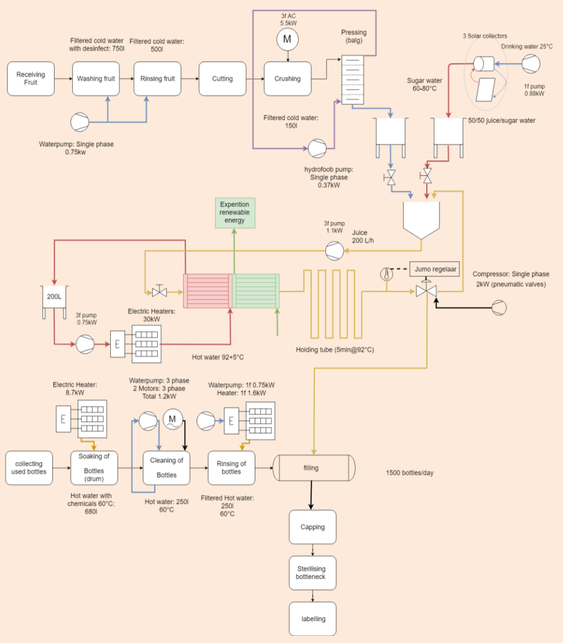
Mali Juisi is a fruit juice company in Muleba, Tanzania. The power supply from the grid is inconsistent, because of this, the quality and continuity of the production cannot be guaranteed. The crucial loads need to be provided with power during a blackout. The load during production is shown in the graph.
The juice production consists of three main steps. Washing, crushing and pressing the fruit to fruit juice is step one. After this, the fruit juice is mixed with sugar water and pasteurized. The last step is filling the bottles and capping it with a crown cap. Another process in the factory is washing bottles and crates.

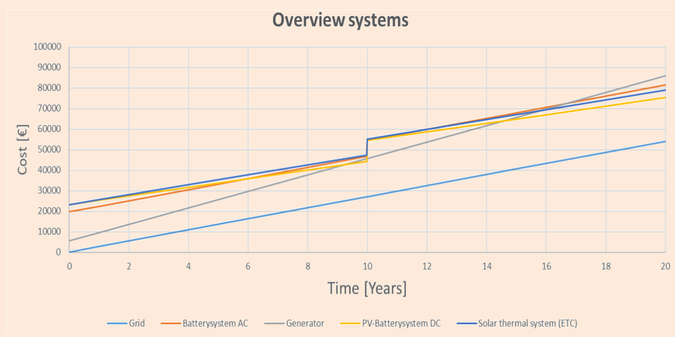






Analysis



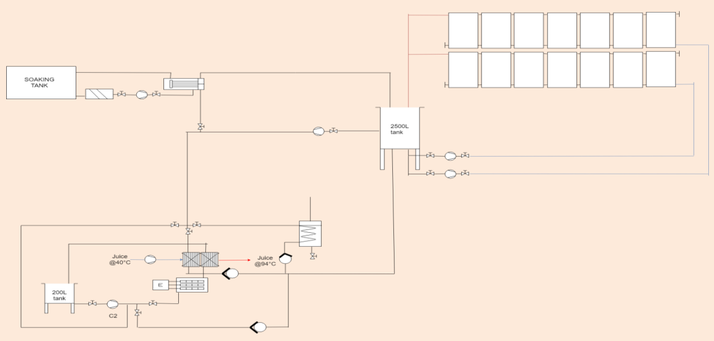


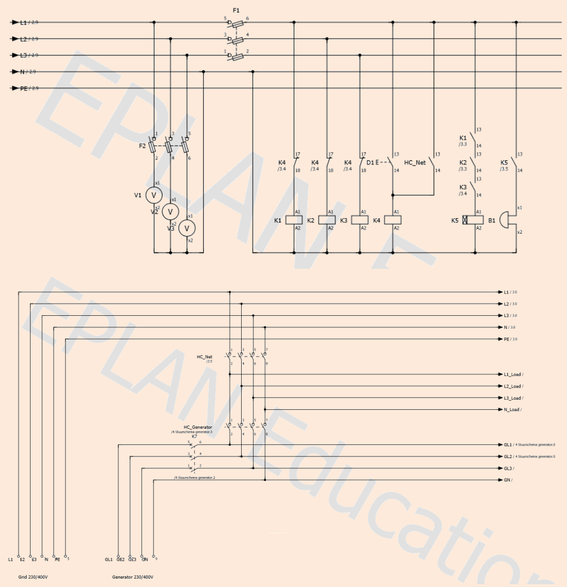
	Weighting [1-5]	Generator	PV-Battery DC	Batterysystem 3-phase	ETC 3-phase finish process	ETC 3-phase stand alone	PV-Battery Stand alone
Purchase price	3	5500	21151	17428,8	23160,85	39389,1	76433,2
Price after 20 Years compared with Tanesco	5	31692	19325	25141	24956	21068	-54031
Investmentcost after 10 Years	2	0	10220	7712	7712	7712	7712
Purchase price relative	3	4,0	1,0	2,0	0,0	0,0	0,0
Relative price after 20 Years compared with Tanesco	4	0,0	2,0	1,0	1,0	1,0	4,0
Investmentcost after 10 Years Relative	2	3	0	1	1	1	1
Simplicity of technology	4	3	1	2	0	0	1
Maintainance	3	0	3	3	3	3	3
Reliability	5	4	2	3	2	2	1
Ease of implemantation	1	4	2	3	0	0	2
Added value	4	0	2	0	1	3	4
Achieveble goal (1:End; 2:DayProduction; 3:FromStart)	2	1	1	1	1	2	3
User friendly	5	2	4	4	3	3	4
Renewable energy	2	0	3	1	3	3	4
Total		63,0	61,0	60,0	45,0	55,0	77,0

The process was examined during an onsite measuring campain, an overview of this process gave more clarity on the possibilities and solutions. Further on different concepts were elaborated. Wind energy, a CHP (combined heat and power), PV-panels, solar thermal collectors, a battery system and a diesel generator were examined and compared. The four most promising systems (shown in the graph) were compared with a decision matrix and a cost-benefit analysis. The technical advantages and disadvantages and the purchase prices were the decisive factors.

Solution

A 2nd hand diesel generator is the most suitable solution for Mali Juisi. It is robust and generally easier to maintain and manage by the personnel than any other solution.
Because of the lower expenses of the generator (€5500) there was budget for an optimisation. This is done with solar collectors. These can cover a large part of the heat demand, which drastically reduces the energy consumption. This solar thermal system will reduce the overall energy cost by 25%.





Supervisors / Cosupervisors: Deferme Wim supervisor (UHasselt)
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