

Direct costs						
Major Process Equipment			Eqpm Cost [EUR]	Eqpm Erection [EUR]	Total Cost [EUR]	Acc. [%]
TOT	Supply and installation MEAM (non microwave)	Equipment number	2.816.061	181.023	2.925.963	13%
	Air flows					
	Air intake filter	1-S-601	4.389	140	4.529	10%
	Exhaust filter stream 100 A/B	1-S-602, 2-S-602	7.022	140	7.162	10%
	Exhaust filter stream 120 A/B	1-S-604, 2-S-604	7.022	140	7.162	10%
	Exhaust filter (wet filter) stream 160 A/B	1-S-607, 2-S-607	200.000	1.120	201.120	10%
	1st Heat exchanger A/B WATER 130°	1-E-603, 2-E-603	15.800	280	16.080	10%
	2nd heat exchanger A/B WATER 130°	1-E-605, 2-E-605	15.400	280	15.680	10%
	3th heat exchanger A/B WATER 130°	1-E-606, 2-E-606	15.800	280	16.080	10%
	4th heat exchanger A/B WITH THERMAL OIL	1-E-608, 2-E-608	44.600	280	44.880	10%
	Water transfer pump 140° 6 bar	1-P-610	1.300	280	1.580	10%
	Water transfer pump 140° 6 bar	2-P-610	1.300	280	1.580	10%
	Water transfer pump 140° 6 bar	1-P-611	1.300	280	1.580	10%
	Water transfer pump 140° 6 bar	2-P-611	1.300	280	1.580	10%
	Water transfer pump 140° 6 bar	1-P-612	1.300	280	1.580	10%
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	Feeding unit					
	Conveyor belt A - 8T/h + hopper + weighing	1-T-101, 1-L-103, 1-L-102	187.200	42.468	229.668	10%
	Conveyor belt B - 8T/h + hopper + weighing	2-T-101, 2-L-103, 2-L-102	187.200	42.468	229.668	10%
	Product spreader A TO Change to other system	1-J-104	35.000	560	35.560	10%
	Product spreader B TO Change to other system	2-J-104	35.000	560	35.560	10%
	Discharge unit & product cooler					
	Heat recovery screw A 350°--> 220° 6tph	1-L-501	120.000	2.000	122.000	20%
	Heat recovery screw B 350°--> 220° 6tph	2-L-501	120.000	2.000	122.000	20%
	Cooling screw A 220° --> 90° 6.6 tph	1-L-503	120.000	2.000	122.000	20%
	Cooling screw B 220° --> 90° 6.6 tph	2-L-503	120.000	2.000	122.000	20%
	Water transfer pump 140° 6 bar		1.300	280	1.580	10%
	Water transfer pump 140° 6 bar		1.300	280	1.580	10%
	Rotary unions HR screw A+B		6.000	280	6.280	10%
	Rotay unions Cool screw A&B		6.001	280	6.281	10%
	Thermal oil pump A/B 150°	1-P-502, 2-P-502	10.000	280	10.280	10%
	Bucket elevator A/B					
	Belt conveyor-A	1-L-504, 2-L-504	60.000	13.612	73.612	10%
	Belt conveyor-B	1-L-505	75.000	17.015	92.015	10%
	Condensation unit					
	Condensation unit Wet Filter exhaust	1-E-609, 2-E-609	70.000	1.120	This is a "could need"	20%
	Fan stream 160 A/B	1-K-610, 2-K-610	20.000	280	20.280	10%
	Condensation unit D-solvation	1-E-802, 2-E-802 +spare	300.000	5.000	305.000	20%
	1 Chiller for 2 lines 1650 kW chilling power	E-804	180.000	20.000	200.000	10%
	Drycooler 1100 kW appr		177.192		177.192	
	water buffer 100m³		34.000	5.000	39.000	20%
	Water transfer pump 140° 6 bar		1.300	280	1.580	10%
	Water transfer pump 140° 6 bar		1.300	280	1.580	10%
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	Water transfer pump 140° 6 bar		1.300	280	1.580	10%
	Water transfer pump 140° 6 bar		1.300	280	1.580	10%
	Heat pump A/B	1-U-701, 2-U-701	453.330	15.000	468.330	15%
	Vacuum system					
	Vacuum buffer vessel A/B (20 à 30m³)		100.000	560	100.560	10%
	Vacuum pump A/B	1-P-807, 2-P-807 + spare	49.000	280	49.280	10%
	Stikstof		1.406	280	1.686	10%
	Perslucht	Kompressor + Droger	16.300	280	16.580	10%
TOT	Supply and installation Microwave technology		6.600.000	0	6.600.000	10%
	Predrying unit 5th generation A/B	1-U-201, 2-U-201	3.000.000	0	3.000.000	10%
	Platforms, Walls		140.000	0	140.000	10%
	Hopper, screw & bucket elevator	1-L-302, 2-L-302, 1-L-303, 2-L-303	80.000	0	80.000	10%
	Exhaust filter D-solvation unit A/B	1-S-801-A/B, 2-S-801-A/B	40.000	0	40.000	10%
	MT D-solvation unit under atmosperic control A/B	1-U-401, 2-U-401	3.340.000	0	3.340.000	10%
	Supply C-Ground		0	0	0	0%
	Options		0		0	0%
	Supply concession		0		0	0%
Subtotal Major Equipment			9.416.061	181.023	9.525.963	11%
Bulk accounts						
	% of C-equipment cost	Material Cost [EUR]	Labour Cost [EUR]	Total Cost [EUR]	Allowance [%]	
Civil				0	20%	
Structural	2,70%	€ 171.300	€ 85.650	€ 256.950	10%	
Electrical	7,20%	€ 685.534		€ 685.534	10%	
Instrumentation sensors		€ 71.030	30%+ for eleantis	€ 92.339	10%	
Instrumentation (except sensors)	0,36%	€ 26.525	30%+ for eleantis	€ 34.483	10%	
Automation	0,36%	€ 34.438		€ 34.438	10%	
Ducting Air Handling stream 160	2,10%	€ 146.297	€ 54.220	€ 200.517	10%	

	Ducting Dedusting from screw/bucket1/bucket2/drop1234	0,26%	€ 10.000	€ 15.000	€ 25.000	10%
	Piping	6,30%	€ 600.000	€ 0	€ 600.000	10%
	Insulation + tracing	1,74%	€ 165.500	€ 0	€ 165.500	10%
	External Inspections				€ 5.000	
	Miscellaneous	2,00%	€ 56.321		€ 56.321	10%
Subtotal Bulk Accounts		22,63%	1.966.944	154.870	€ 2.156.081	10%
Allowances						
Major equipment						
	% on equipment cost					
	% on bulk accounts				215.108	
Bulk accounts						
	Take-off growth & cutting losses	5%	107.804		107.804	
Subtotal Allowances					322.912	
Engineering & Construction						
			Manhours	Rate	Total Cost	Acc.
				[EUR]	[EUR]	[%]
E1	Civil Study, Permit, Architect				0	
E2	Internal Engineering	Process + Mechanical + EIA				
	Incl. fire study					
	Incl. fire extinguishers - first aid					
	Incl. Safety study					
	Incl. Safety plan (VGM)					
	Incl. Emergency lighting					
	Incl. Lightnting protection					
	Incl. Signs (emergency - informational)					
	Incl. Emergency showers - eyewash					
	Incl. IT network					
	Incl. CE certification					
	Incl. MER study					
	Incl. noise study					
	Incl. site security					
	Incl. odor study					
	Incl. electrical conncection to grid					
	Incl. electrical batteries					
	Incl. temporary contractor village					
	Incl. water spraying system end product to prevent dust					
	Incl. Project Control	Project Management Team				
E3	External Engineering	all disciplines			797.076	
E4	External Engineering	PM			73.994	
E6	External Engineering	Civil + Structural			57.341	
E7	External Engineering	Process			155.853	
E8	External Engineering	Piping			164.273	
E5	External Engineering	Equipment			26.345	
E9	External Engineering	Electrical & Automation			76.822	
E10	External Engineering	Instrumentation		included eleantis	0	
E11	External Engineering	Procurement			50.100	
E12	External Engineering	Construction follow-up			93.937	
E13	External Engineering	Safety officer			31.312	
E14	External Engineering	Mechanical completion			44.732	
E14	External Engineering	Start-up			22.366	
Subtotal Engineering & Construction Manhour Costs					797.076	
			Material Cost	Labour Cost	Total Cost	Acc.
			[EUR]	[EUR]	[EUR]	[%]
L	Site Development				0	
2.	Consumables				0	
Subtotal Additional Construction Costs					0	
Subtotal Engineering & Construction					797.076	
TOTAL BASE ESTIMATE					12.803.000	
Escalation						
-	Price escalation	5%			640.150	
Contingencies						
Major equipment						
-	Reworks for construction	0,3%		23.815	23.815	
-	Technical contingencies	2,5%	235.402		235.402	
Subtotal Contingencies Major Equipment			235.402	23.815	259.216	
Bulk accounts						
-	Reworks for construction	5%			0	
-	Technical contingencies	5%			0	
Subtotal Contingencies Bulk Accounts			0	0	107.804	
Engineering & Construction						
-	Technical contingencies	10%			79.708	
Subtotal Contingencies Engineering & Construction					79.708	
Subtotal Contingencies					446.728	
TOTAL ESTIMATED COST					13.890.000	
Insurance					114.312	
CAPEX BUDGET					14.005.000	

MIN. CAPEX BUDGET	88%	12.325.000
MAX. CAPEX BUDGET	112%	15.686.000

For information: $P(10) = xxx \text{ k€}$ $P(35)-P(40) = \text{base estimate without Contingencies} = xxx \text{ k€}$ $P(50) = \text{base estimate including contingencies} = xxx \text{ k€}$ $P(90) = xxx \text{ k€}$ **Excluded from cost estimate:**

* OPEX Costs of operating the facility (raw materials, utilities, salaries, maintenance)

* Taxes, custom duties

* Finance fees, bank interests

* Costs due to risks not covered by insurance

Services after engineering and procurement

Construction follow-up	93.937
Safety officer on site	31.312
Mechanical completion	44.732
Start-up	22.366
Operations: 3month FT, 3 month HT, 6 month 1.5d/week	122.118

Spare parts to take in stock

Opex cost**314.466****Explanation Allowances & Contingencies**Design growth allowance (or design development allowance):

Applied on main equipment only. This is interpreted as based on the historical experiences on previous projects for minor changes made to the designed equipment, necessitated due to engineering revisions for stability, stiffness, additional nozzles, lifting lugs, etc ...

General experience is that this allowance is always consumed.

Take off growth (MTO):

This allowance is interpreted as the estimator's confidence in this take-off (based on documents and drawings or sketches) of the commodities. The allowance is deemed to be for quantities which the estimator / the specialist was not able to take off, and is assumed to be spent or which historical data shows will be spent.

Re-works for construction:

Statistical allowance in order to cover usual volume of modifications.

Technical contingencies:

Technical contingencies based on actual project scope and definition, covers mainly:

- Price level accuracy
- Minor sizing adjustment on equipment and bulk
- Induced cost due to delay and recovery plan

Not included within contingencies

- Contractual risks : liquidated damages for delay, performance, etc ...

- General Risks : Bankruptcy of Vendors / Subcontractors, Consequence of delays on subcontractor costs, overruns beyond technical contingencies coverage ...