Statement of the European Starch Industry Association (AAF):

The starch industry supports the conclusions compiled in the Food, Drink and Milk BREF and agrees with the listed BAT's and related indicative Emission Levels.

List of unit operations specific to the starch sector and related comments

Unit Operation	BREF references				Starch slurry production from			Sweeteners from starch slurry	Native or modified starches from starch slurry	Remarks
	Chap 2	Chap 3	Chap 4	Chap 5	Maize	Wheat	Potato			
Materials handling and storage	2,1,1,1	3,2,1	4,1,7,2	5,1,4,1 - 5,1,5	Unloading & storage of incoming maize - germ, feed and protein storage & truck loading	Unloading & storage of incoming wheat - wheat floor, gluten and feed storage & truck loading	Incoming potatoes / co-products storage and loading	Unloading & storage of incoming starch - handling & storage of finished product	Unloading & storage of incoming starch - handling & storage of finished product (dry starch)	Some products are packed, for end-used by industry (not final consumers)
Sorting/screening, grading, dehulling, destemming. destalking and trimming	2,1,1,2	3,2,2	4,1,7,6&7		Cleaning incoming maize	Cleaning incoming wheat	Mechanical cleaning of incoming potatoes			
Washing	2,1,1,4	3,2,4	4.2.14				Pre washing / end washing of potatoes			
Cutting, slicing, chopping, mincing, pulping and pressing	2,1,2,1	3,2,5			Germ , feed and protein pressing for dewatering		Rasping/cutting (milling) of potatoes			
Mixing/blending, homogenisation and conching	2,1,2,2	3,2,6			Maize types blending	Wheat types blending		Blending of different starch hydrolysates	Blending of different starch types	
Grinding/milling and crushing	2,1,2,3	3,2,7			steeped Maize kernel crushing - maize fibre- and gluten milling	Wheat kernel milling - wheat fibre- and gluten milling		For removal of dried product agglomerates	For removal of dried product agglomerates	
Forming/moulding and extruding	2,1,2,4	3,2,8							Production of pregelatinised starch types with extrusion	
Deionisation	2,1,3,2	3,2,10						Demineralisation of starch hydrolysates		
Centrifugation and sedimentation	2,1,3,4	3,2,12	4,2,3	5,1,4,2	Starch slurry washing - starch/protein separation - protein/water separation - protein dewatering -	Starch slurry washing - starch/protein separation - protein/water separation - protein dewatering -	Separation of starch from slurry	Protein removal, Washing of dextrose crystals - dewatering of dextrose crystals	Washing of modified starch - dewatering of starch slurries	

Unit Operation	BREF references				Starch slurry production from			Sweeteners from starch slurry	Native or modified starches from starch slurry	Remarks
	Chap 2	Chap 3	Chap 4	Chap 5	Maize	Wheat	Potato			
Filtration	2,1,3,5	3,2,13			Separation of starch from slurry , dewatering of gluten, maize oil filtration	Separation of starch from slurry	Separation of starch from slurry	Separation of starch from slurry - protein removal from starch hydrolysates - removal of filter earth from starch hydrolysates - microbial filtration of starch hydrolysates - removal of	Separation of starch from slurry - removal of impurities from starch slurries - recovery of starch from dryer exhaust air	
Membrane separation	2,1,3,6	3,2,14						Protein removal from starch hydrolysates -		Preparation of demineralised water via reverse osmosis
Crystallisation	2,1,3,7	3,2,15						Crystallisation of dextrose from starch hydrolysate		
Decolourisation	2,1,3,11	3,2,19						Discoloration of hydrolysates with activated carbon		
Soaking	2.1.4.1	3.2.21			First step in process to soften maize kernel					We recover the protein content from processed water
Dissolving	2,1,4,2	3,2,22						Various process steps involve dissolving of crystalline dextrose, fructose, maltodextrins	Re-slurrying from dried starch before modification	
Coagulation	2,1,4,5	3,2,25					Protein recovery from fruit juice	Protein coagulation during hydrolysate refining		Process unit description not relevant to the starch sector
Sulphitation	2,1,4,10	3,2,30			Sulphitation of maize soaking water		Preserving potato pulp after rasping	Sulphitation of specific starch hydrolysate types, for preserving quality	Sulphitation for specific modifications, for preserving quality	
Coating/spraying/enrobing/ agglomeration/encapsulation	2,1,4,13	3,2,33							Production of specific starch types	For production of specific types products
Pasteurisation, sterilisation and UHT	2,1,5,8	3,2,42						To ensure microbial quality of starch hydrolysates	To ensure microbial quality of starch products	
Evaporation (liquid to liquid)	2,1,6,1	3,2,43	4,2,9	5,1,4,6	Maize soaking water (steep water) evaporation	Evaporation of secondary starch streams	Fruit juice concentration	To remove water from refined starch hydrolysates		
Drying (liquid to solid)	2,1,6,2	3,2,44			Protein dewatering	Protein dewatering	Starch and protein drying	Dewatering of dextrose massecuite, spray drying	Dewatering of starch suspensions	In the starch industry, it is "suspension to solid" - not dewatering but drying of starch and protein (for air emissions see 5.1.5)

Unit Operation	BREF references				Starch slurry production from			Sweeteners from starch slurry	Native or modified starches from starch slurry	Remarks
	Chap 2	Chap 3	Chap 4	Chap 5	Maize	Wheat	Potato			
Dehydration (solid to solid)	2,1,6,3	3,2,45			Dewatered protein, germs and fibres drying - different kind of dryers used	Dewatered proteins and fibres drying	Drying	Drying of dewatered dextrose	Drying of dewatered starch	
Cooling, chilling and cold stabilisation	2,1,7,1	3,2,46	4,2,10	5,1,4,8	Protein slurry cooling - Process water cooling - Germ, feed & protein cooling	Process water cooling - Wheat feed cooling	Pneumatic cooling transport	Various cooling steps during starch hydrolysate refining	During production of certain modified starches	Cooling BREF
Packing and filling	2,1,8,1	3,2,49	4,2,12	5,1,4,9	Protein	Protein	Protein	All products	Dried starch	
Cleaning and disinfection	2,1,9,1	3,2,51	4.3	5,1,3	Cleaning of process equipment, vessels & piping	Cleaning of process equipment, vessels & piping	Cleaning of process equipment, vessels & piping	Cleaning of process equipment, vessels & piping	Cleaning of process equipment, vessels & piping	
Energy generation and consumption	2,1,9,2	3,2,52	4,2,13&17		Consumption of steam and power	Consumption of steam and power	Consumption of steam and power	Consumption of steam and power	Consumption of steam and power	Combined generation of steam and power in CHP plants, steam boilers, purchasing electricity from the grid.
Water use	2,1,9,3	3,2,53	4,1,7,8 - 4,2,14 - 4,5 - 4,5,7,6 - 4,7,6	5,1,6 - 5,2,6	Washing of starch suspensions - separation of constituents - Make-up water for cooling towers	Washing of starch suspensions - separation of constituents - Make-up water for cooling towers	Washing of raw material and of starch suspensions - Reference 4,5,7,6,3 not commonly applicable	Dissolving operations - make-up water for cooling towers - dilution of ion exchange chemicals	"Washing" of starch suspensions	
Vacuum generation	2,1,9,4	3,2,54			Evaporation of steep water under vacuum, vacuum filtration	Evaporation of secondary starch streams under vacuum	Evaporation of fruit juice - For rotary filters	Evaporation of hydrolysates under vacuum, vacuum filtration	Vacuum filtration	
Compressed air generation	2,1,9,6	3,2,56	4,2,16	5,1,4,12	For different uses in the plant (valve actuators etc.)	For different uses in the plant (valve actuators etc.)	For instrumentation and pneumatic transport	For different uses in the plant	For different uses in the plant (valve actuators etc.)	Many recommendations can be considered as good practices and can be found under section 5.1.4.12
Waste water treatment		3.3.7.2			Use of anaerobic, aerobic and physico-chemical treatment, as well as buffer basins					Different kind of on site waste water treatment plants are used, or the effluent is treated off side, or land spreading
Emissions to air			4,4,3							