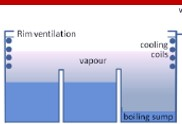
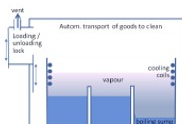
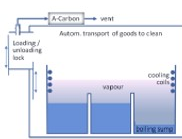
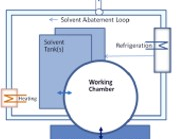
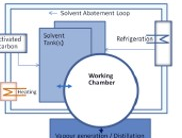
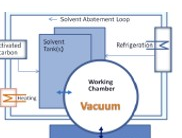


Appendix V: ECSA Machine Types

Current ECSA Nomenclature ¹⁾	Schematic Drawing	Key characteristic (Key improvement in red)	Legal compliance	Nomenclature Reference /equivalence in European Standard EN 12921-4 ³⁾	Nomenclature Reference /equivalence in J.von Grote, ETH Diss. #15067 of 2003 ⁴⁾
Type I Open Top		<ul style="list-style-type: none"> Open Top Rim ventilation Cooling with water or Refrigerated cooling (2°C). Typical air emission: between 1-16 kg/h, average 4.7 kg/h 		As "Open top tank" in Figure A.4 of Appendix A.	Water cooling: As Type I "open top water cooled" Refrigerated cooling: As Type II "open top electro- cooled"
Type IIa enclosed (vented directly to atmosphere)		<ul style="list-style-type: none"> Encased (all side closed) Vented Air lock for loading / unloading of goods Refrigerated cooling Automatic transport of goods Typical air emission: 2.0 kg/h 		As "Type II – enclosed open cleaning machine" in Figure A.3 of appendix A.	As Type III "encased machines"
Type IIb Enclosed & abatement (vented through external A-Carbon filter)		<ul style="list-style-type: none"> As type IIa but with additional external A-carbon filter for solvent abatement from exhaust air. Typical air emission: 1.0 kg/h 	<ul style="list-style-type: none"> May fulfil German Emiss. Directive "2.BlmSchV" in old Version of 1986 May enable the fulfilment of limits set by EU-SED²⁾ 		
Type III Closed with internal air cleaning prior to opening		<ul style="list-style-type: none"> Closed single chamber or use of a collection chamber (air-lock to seal against solvent bathe(s)) Solvent abatement loop with refrigeration (<-20°C) to clean air prior to opening (<2g/m³) Typical air emission: 155g/h 	<ul style="list-style-type: none"> Generally fulfils requirements of German Emiss. Directive "2.BlmSchV" Designed to comply with SED limits. 	Type I – sealed cleaning machines differentiated by Type Ia – Collection chamber systems Fig. A.1 of Appendix A. and Type Ib – Single chamber cleaning machine Fig. A.2 of Appendix A.	As Type IV "one chamber "machines"
Type IV Closed with closed loop air drying without vent		<ul style="list-style-type: none"> No exhaust air (Fully closed air loops) Equipm. Internal A- carbon in addition to refrigeration. Better drying also of goods with difficult shapes. Typical air emission: 1-100 g/h, average about 38 g/h 	<ul style="list-style-type: none"> Generally fulfils requirements of German Emiss. Directive "2.BlmSchV" Designed to comply with SED limits. 	Not yet known to EN 12921-4	As Type V "closed loop drying one chamber "machines"
Type V Closed without vent and operation under vacuum		<ul style="list-style-type: none"> As type IV but with Vacuum technology, keeping the working chamber and distillation under reduced pressure during operation Improved drying Reduced emissions Reduced waste Increased solvent life time (because of lower temperature) 	<ul style="list-style-type: none"> Generally fulfils requirements of German Emiss. Directive "2.BlmSchV" Designed to comply with SED limits. 	Not yet known to EN 12921-4	Was not yet known to the thesis

ENCLOSED / OPEN TOP Equipment

CLOSED Equipment