

**Table S1.** Summary and comparison of the average overall gas holdup for Case1-4; ECVT data vs. visual reference (VR), mean values and overall mean deviation. The mean deviations were calculated as percentage ratios of the ECVT versus the visual reference.

Liquid flow mode	POCS type	Average overall gas holdup $\varepsilon_G$ / - x10 <sup>-3</sup>	Superficial gas velocity $u_G$ m*s <sup>-1</sup> x10 <sup>-3</sup>					
			2.6	5.2	7.7	10.3	12.9	15.5
Stagnant	w/o	ECVT	12.0	17.1	25.2	33.9	44.0	53.6
		Visual reference	9.4	20.0	26.5	30.3	41.7	45.5
Mean deviation / %		Difference / %	-26.8	14.7	4.9	-11.6	-5.4	-17.9
13.5		Difference absolut / %	26.8	14.7	4.9	11.6	5.4	17.9
Stagnant	6mm regular	ECVT	9.9	18.1	23.8	35.3	42.6	47.0
		Visual reference	10.7	18.6	26.3	32.7	45.2	51.3
Mean deviation / %		Difference / %	7.5	2.3	9.5	-8.0	5.6	8.3
6.9		Difference absolut / %	7.5	2.3	9.5	8.0	5.6	8.3
Stagnant	6mm on the tip	ECVT	20.3	34.2	46.7	58.8	75.7	90.9
		Visual reference	17.3	28.9	39.1	51.4	65.8	80.9
Mean deviation / %		Difference / %	-17.4	-18.0	-19.6	-14.4	-15.0	-12.3
16.1		Difference absolut / %	17.4	18.0	19.6	14.4	15.0	12.3
Stagnant	5mm on the tip	ECVT	62.8	122.8	168.9	215.1	261.7	306.3
		Visual reference	19.9	39.1	51.4	57.5	69.4	80.9
Mean deviation / %		Difference / %	-215.4	-214.3	-228.4	-274.2	-277.3	-278.4
248.0		Difference absolut / %	215.4	214.3	228.4	274.2	277.3	278.4
Stagnant	6mm/5mm dissimilar	ECVT	13.6	26.5	47.6	66.3	77.3	94.1
		Visual reference	16.0	28.9	45.3	69.4	80.9	92.3
Mean deviation / %		Difference / %	15.2	8.5	-5.1	4.3	4.5	-2.0
6.6		Difference absolut / %	15.2	8.5	5.1	4.3	4.5	2.0
Circulation	w/o	ECVT	1.4	3.9	6.9	10.4	13.0	17.6
		Visual reference	2.3	7.0	13.8	18.4	21.7	27.3
Mean deviation / %		Difference / %	38.8	44.5	49.9	43.5	40.1	35.6
42.1		Difference absolut / %	38.8	44.5	49.9	43.5	40.1	35.6
Circulation	6mm on the tip	ECVT	16.4	29.2	40.0	46.9	56.2	64.4
		Visual reference	5.8	12.8	19.6	26.3	30.8	38.5
Mean deviation / %		Difference / %	-181.0	-128.4	-103.8	-78.1	-82.4	-67.5
106.9		Difference absolut / %	181.0	128.4	103.8	78.1	82.4	67.5
Circulation	5mm on the tip	ECVT	28.6	34.4	45.2	52.0	75.2	102.7
		Visual reference	5.8	12.8	18.5	21.9	31.9	35.2
Mean deviation / %		Difference / %	-388.5	-169.0	-144.6	-138.0	-135.8	-191.9
194.6		Difference absolut / %	388.5	169.0	144.6	138.0	135.8	191.9
Circulation	6mm/5mm dissimilar	ECVT	5.6	8.1	9.6	19.4	24.1	26.4
		Visual reference	4.7	11.6	19.5	25.1	31.7	37.2
Mean deviation / %		Difference / %	-19.4	30.1	50.9	22.5	24.0	28.9
29.3		Difference absolut / %	19.4	30.1	50.9	22.5	24.0	28.9

**Figure S1.** ECVT using gear (type: Gather Industrie® D2X30) vs. centrifugal pump (type: Rover Pompe BE – M 20 IP 55).

