Meaning			Formulas
Number of trays	:	N	Aspen Process Optimisation
Height	:	H	$H = 0.5\,N + 3$
Tangent-to-tangent length	:	L	$L = 0.5\,N$
Diameter Calculation for DWSTU Column:			
Reflux ratio	:	RR	From Aspen Plus Simulation
Distillate	:	D [kg/s]	From Aspen Plus Simulation
Liquid flowrate	:	L [kg/s]	$L = R \cdot D$
Vapor flowrate top of column	:	V [kg/s]	$V = D \cdot (1+RR) + F$
Vapor density	:	ρ_V [kg/m^3]	From Aspen Plus Simulation
Liquid density	:	ρ_L [kg/m^3]	From Aspen Plus Simulation
Flow parameter	:	F_{LV}	$\frac{L}{V} \cdot \left(\frac{\rho_V}{\rho_L}\right)^{0.5}$
Flooding capacity factor	:	$C_{sb,f}$	$\log_{10} C_{sb,f} = -1.0262 - 0.63513 \cdot \log_{10}(F_{LV}) - 0.20097 \cdot \log_{10}(F_{LV})^2$
Flooding velocity	:	u_f [ft/s]	$u_f = C_{sb,f} \cdot 1.3 \cdot \left(\frac{\rho_V}{\rho_L - \rho_V}\right)^{0.5}$
Vapor velocity	:	u_V	$u_V = 0.8 \cdot u_f$
Active area	:	A	$A = \frac{V}{\rho_V \cdot u_V}$
Diameter	:	D	$D = \left(\frac{4 \cdot A}{\pi}\right)^{\frac{1}{2}}$
Lowest pressure :	:	P_o [psig]	Aspen Plus Process Simulation
Design Pressure :	:	P_d [psig]	For P_o between 0 and 5: $P_d = 10$ For P_o between 10 and 1000 psig: $P_d = \exp\{0.60608 + 0.91615[\ln(P_o)] + 0.0015655[\ln(P_o)]^2\}$ For P_o bigger than 1000 psig: $P_d = 1.1\,P_o$
Highest operating temperature	:	T_o [°F]	Aspen Plus Process Simulation
Design temperature	:	T_d [°F]	$T_d = T_o + 50\ °F$
Modulus of elasticity	:	E_M [psi]	For $-20 < T_d <= 200$: $E_M = 30.2\ 10^6$ For $200 < T_d <= 400$: $E_M = 29.5\ 10^6$ For $400 < T_d <= 650$: $E_M = 28.3\ 10^6$ For $T_d > 650$: $E_M = 26\ 10^6$
Maximum allowable stress	:	S [psi]	For $-20 < T_d <= 750$: $S = 15000$ For $750 < T_d <= 800$: $S = 14750$ For $800 < T_d <= 850$: $S = 14200$ For $850 < T_d <= 900$: $S = 13100$
Wall thickness Correction factor Total wall thickness	: : :	t_E t_{EC} t_t [in]	For atmospheric or high pressures: H and L in inches $t_{E1} = \frac{0.22\,((D_i + t_{E1}) + 18)\,L^2}{S\,(D_i + t_{E1})^2}$ $t_{E2} = \frac{P_d \cdot D_i}{2 \cdot S \cdot E - 1.2 \cdot P_d}$ $t_t = \frac{t_{E1} + t_{E2}}{2}$ For vacuum operation: H and L in inches $t_E = 1.3 \cdot (D_i + t_E) \cdot \left(\frac{P_d \cdot L}{E_M \cdot (D_i + t_E)}\right)^{0.4}$ for $\frac{t_E}{D_i} \leq 0.05$ $t_{EC} = L \cdot (0.18 \cdot D_i - 2.2) \cdot 10^{-5} - 0.19$ $t_t = t_E + t_{EC} + 0.125$
Weight of shell and two heads	:	W	$W = \pi\,(D + t_S)\,(L + 0.8\,D)\,t_S\,\rho_{carbon}$ L and D in inches , $\rho_{carbon} = 0.284$ lb/in^3