Important Differences Between WRITE™ and Delayed Coking

Item	Delayed Coking	WRITE™ Process	Comment
Yield of SCO	Base	Same	Expect WRITE™ to be 3 lv% higher. Requires steady-state pyrolyzer operation.
Gravity	29.2	24.7	Delayed Coking SCO is lighter
Product Quality	Base	Heavier, higher sulphur	Heavier, higher sulphur SCO product from WRITE™
Coke Make	Base	Base – 20 wt%	Lower coke make with WRITE™
Fuel Gas Make	Base	Base – 40%	Lower intensity cracking with WRITE™
CO_2 production	Base	Base – 30 wt%	Lower CO_2 production with WRITE™
Make – Up Water	Base	Base – 20 wt%	Lower make-up water use for WRITE™
Capital Cost	Base	Base – 24%	Lower capital costs for WRITE™
Fixed Cost	Base	Base – 24%	
Technical Risk	Low	Medium	The pyrolysis unit of the WRITE™ process is unproven
other	Commercial	Not commercial	Delayed coking is industry proven

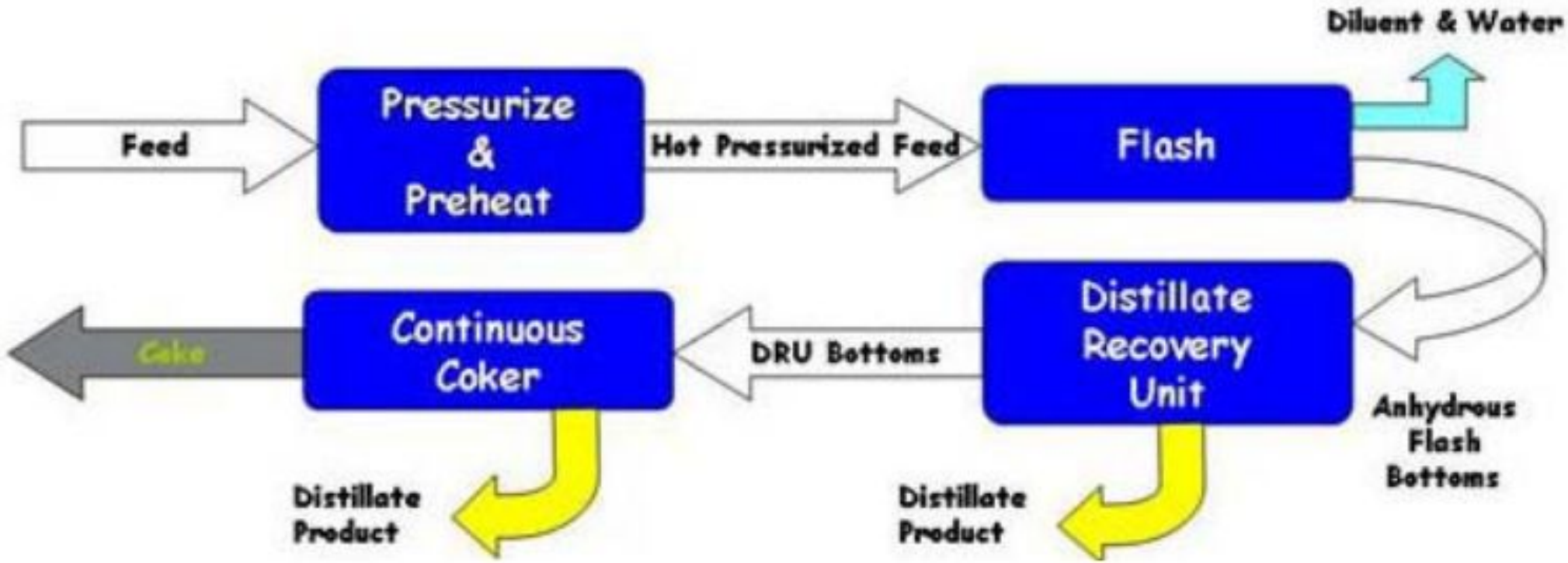


Figure 1. Processing Diagram for WRITE™

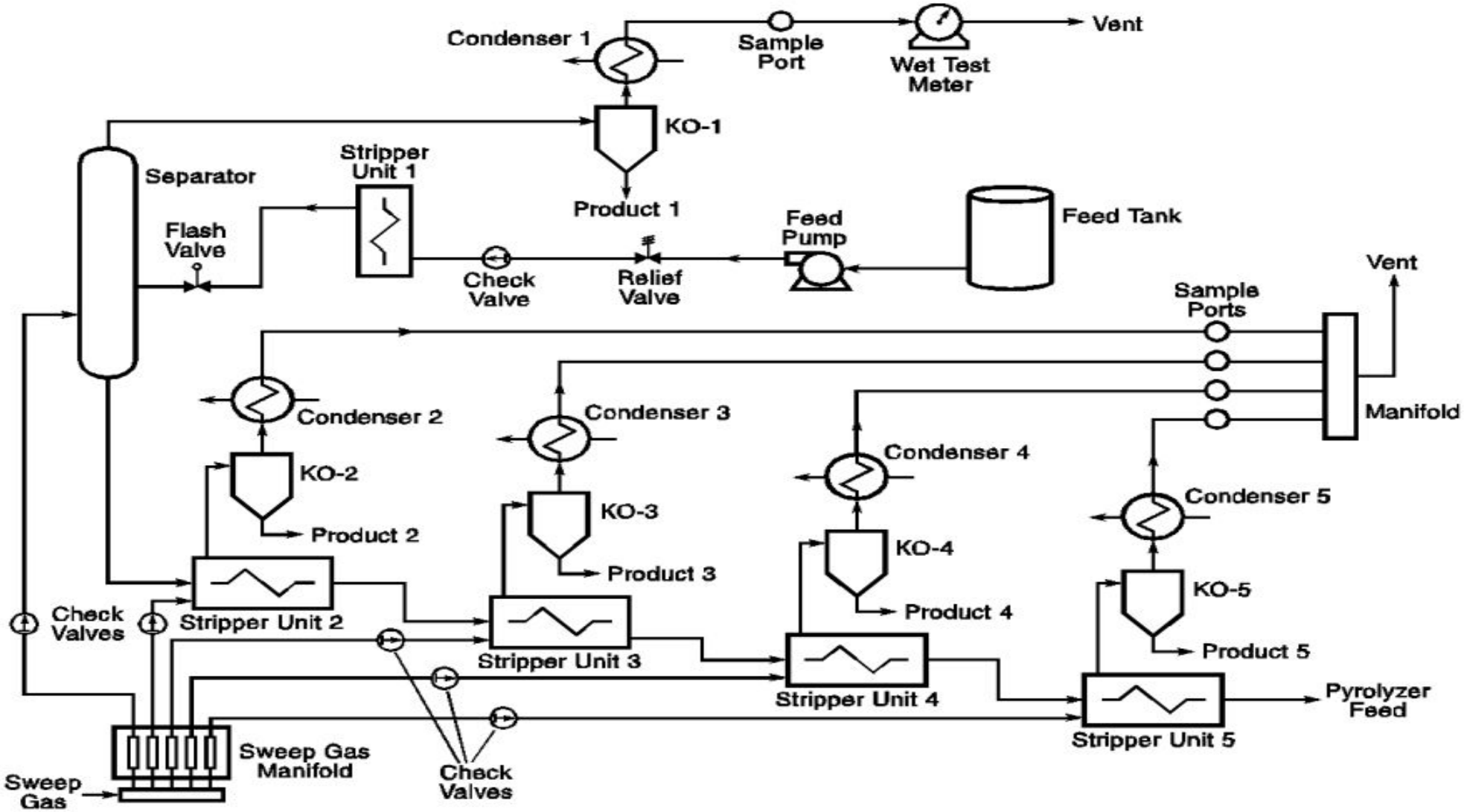


Figure 2. Schematic of the WRITE™ Process Bench-Scale Flash-Stripper Unit.

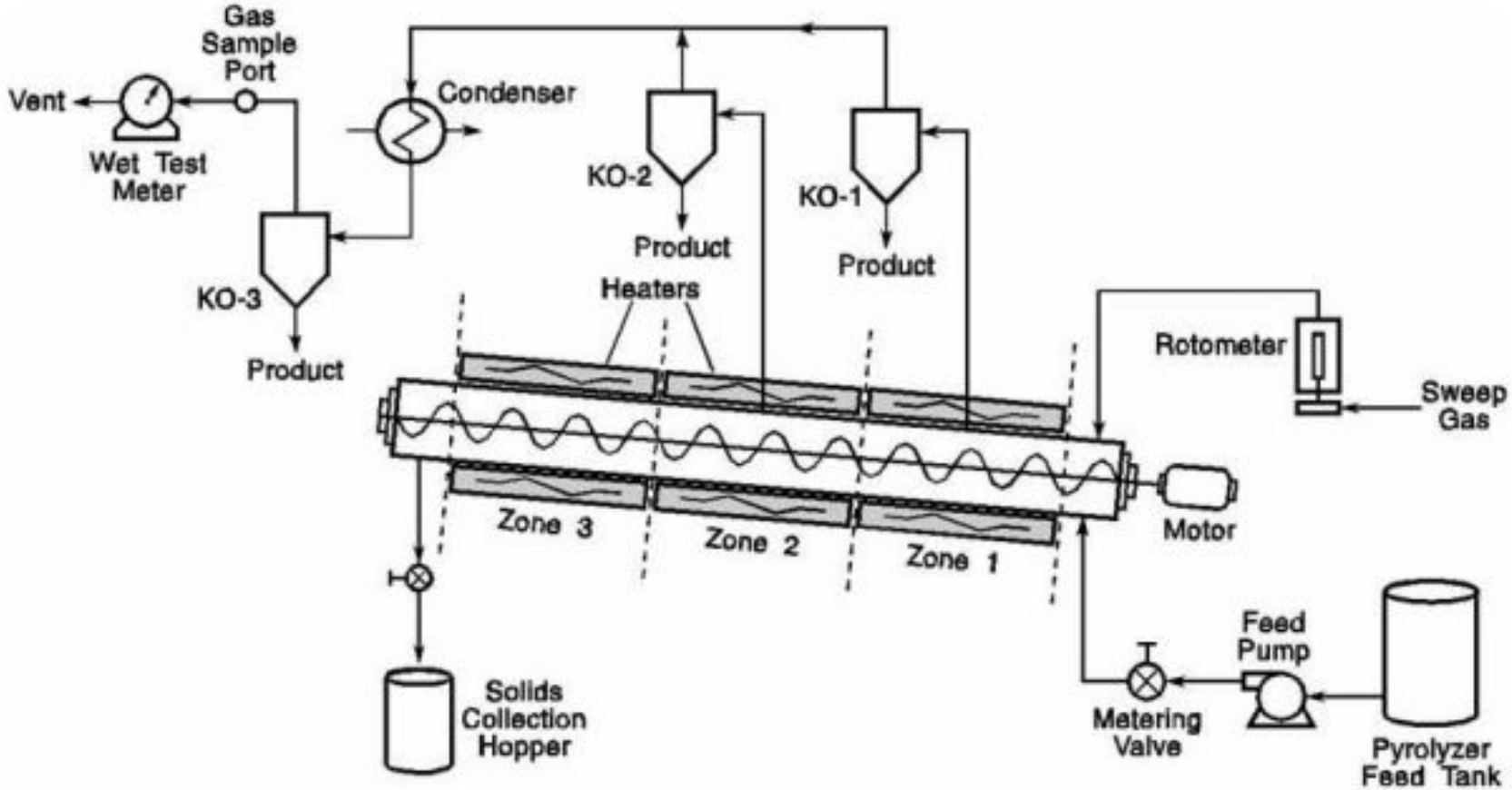
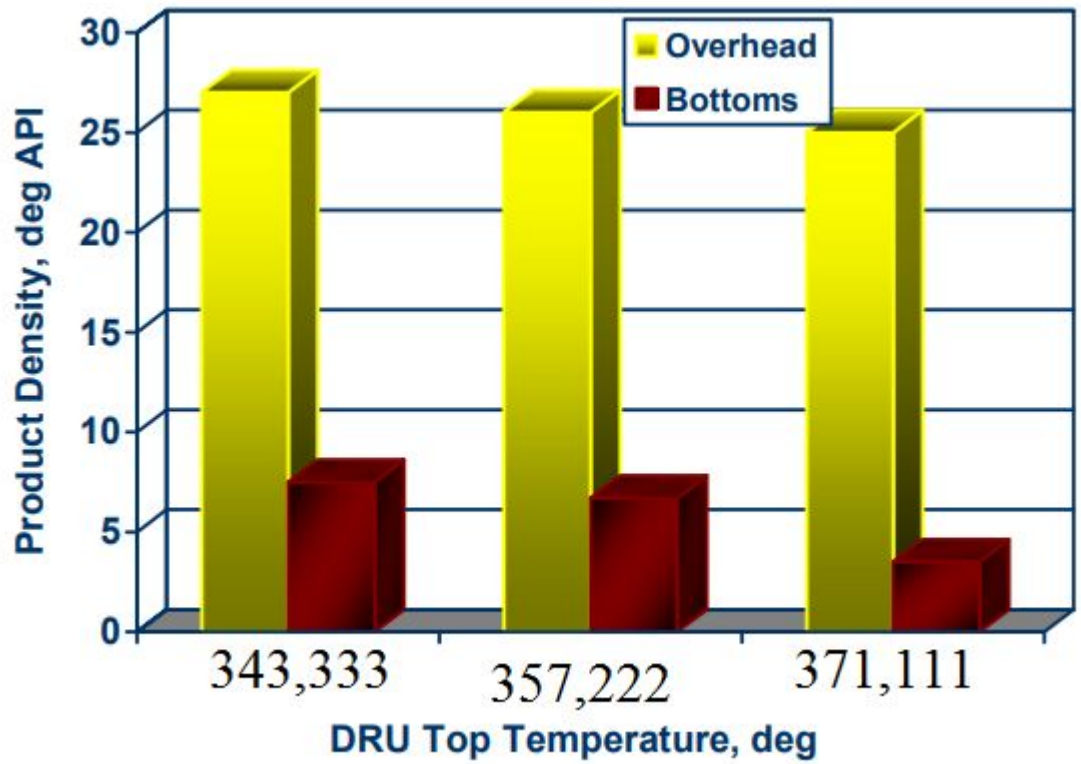


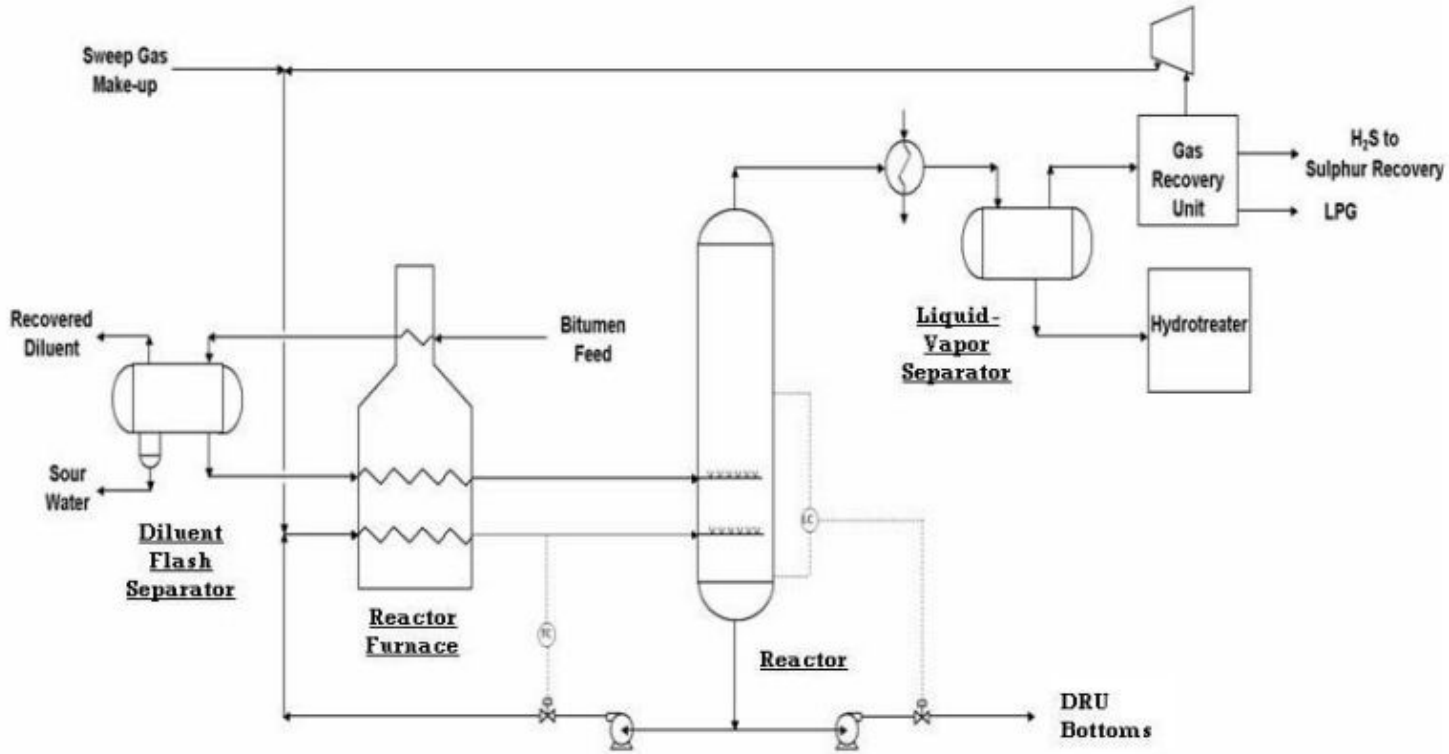
Figure 3. Schematic of the WRITE™ Process Bench-Scale Continuous Coker.

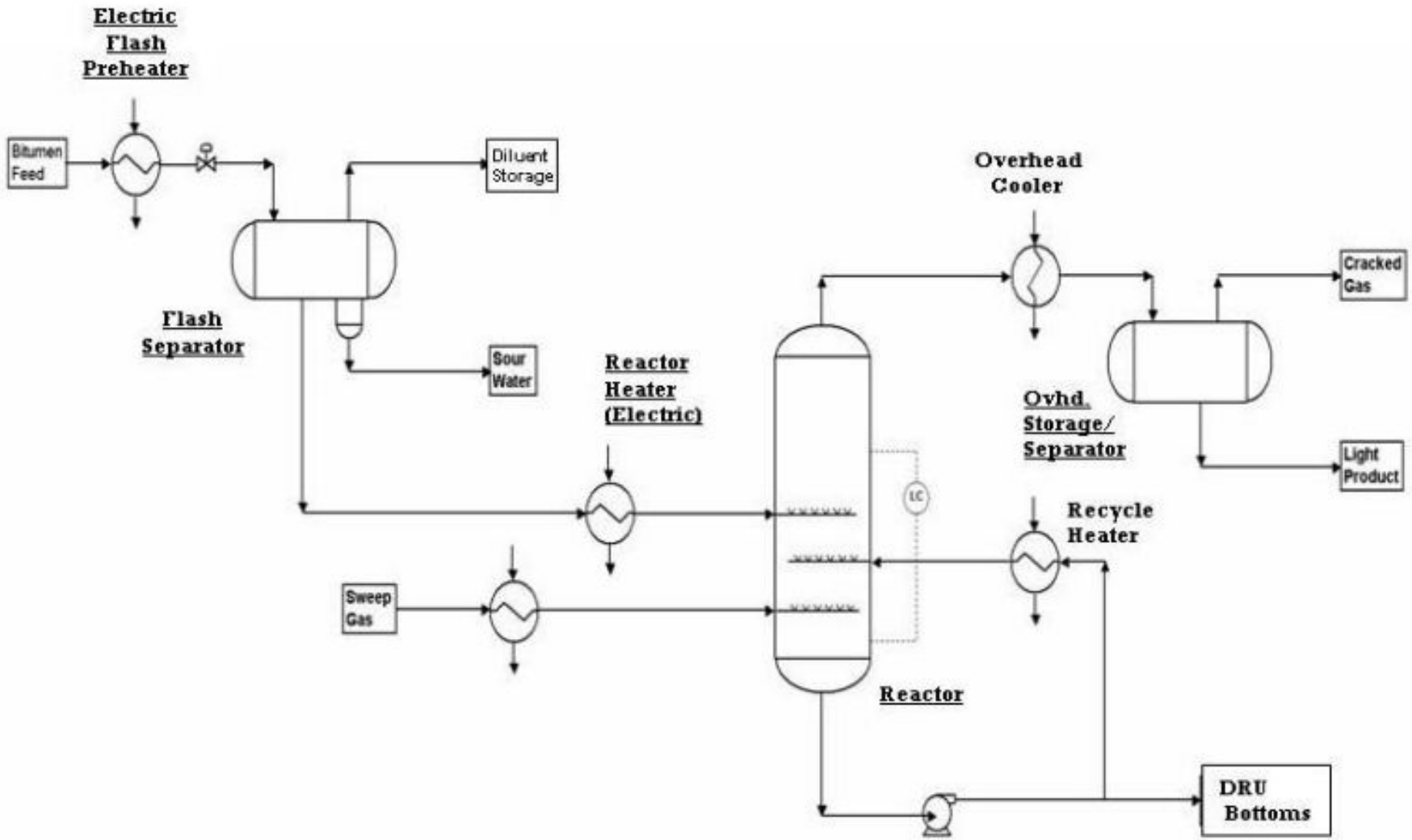

Overhead
Bottoms
Product Density, deg API
30
25
20
15
10
5
0
343,333
357,222
371,111
DRU Top Temperature, deg

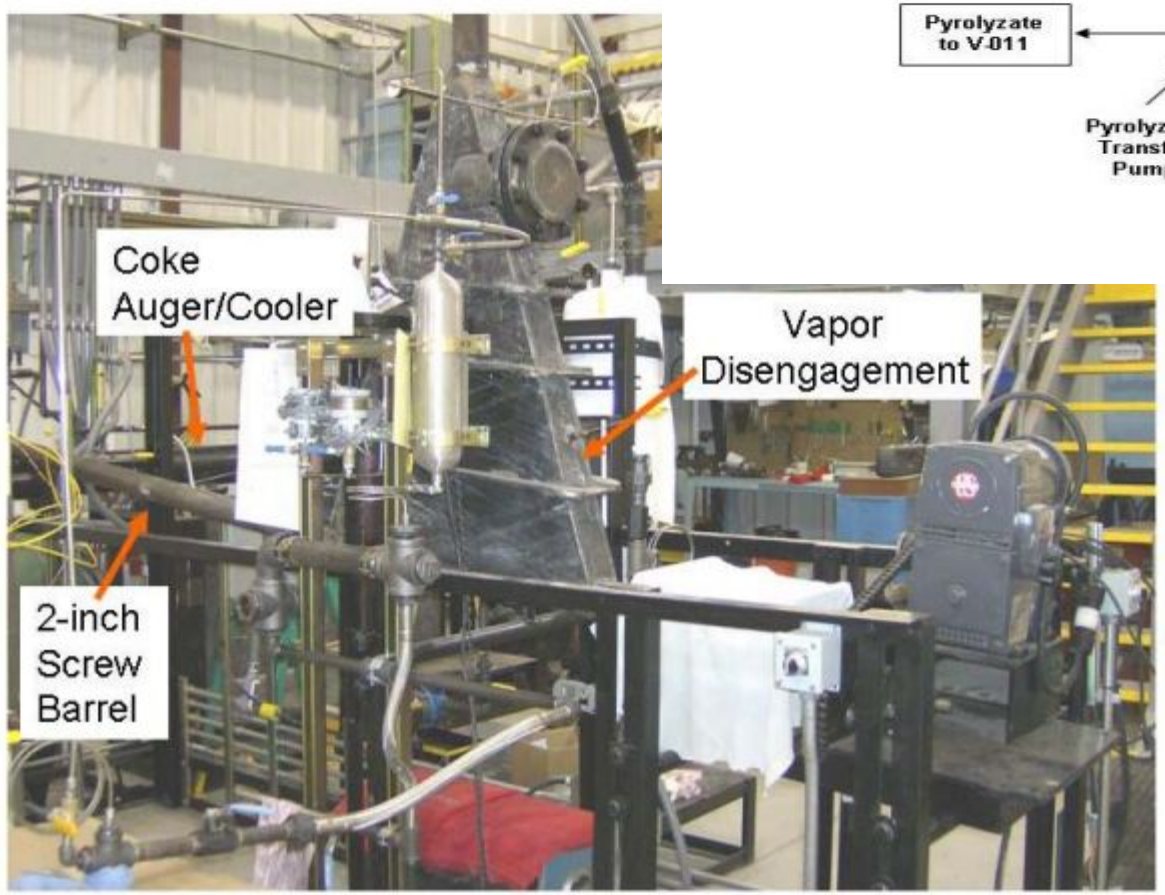
Property	High Space Velocity, 1.0*SV		Lower Space Velocity, 0.6*SV	
	CO_2	CH_4	CO_2	CH_4
Carbon, wt%	85.58	84.80	85.26	84.64
Hydrogen, wt%	9.08	9.24	9.24	8.22
Nitrogen, wt%	0.96	0.90	0.59	1.07
Sulfur, wt%	5.17	5.29	5.18	5.28
Diene Value, g I_2/100 g	17.56	13.2	16.29	10.77
Density, °API	5.08	4.69	3.65	1.61
Viscosity @ 100°C, cSt	698	752	1190	1010
P Value	1.82	2.06	1.38	1.12
SARA, wt%				
Saturates	11.93	12.63	12.10	12.20
Aromatics	39.94	39.94	38.28	35.84
Resins	24.80	25.37	23.16	20.25
C_5 Asphaltenes, wt%	23.33	22.06	26.46	31.71

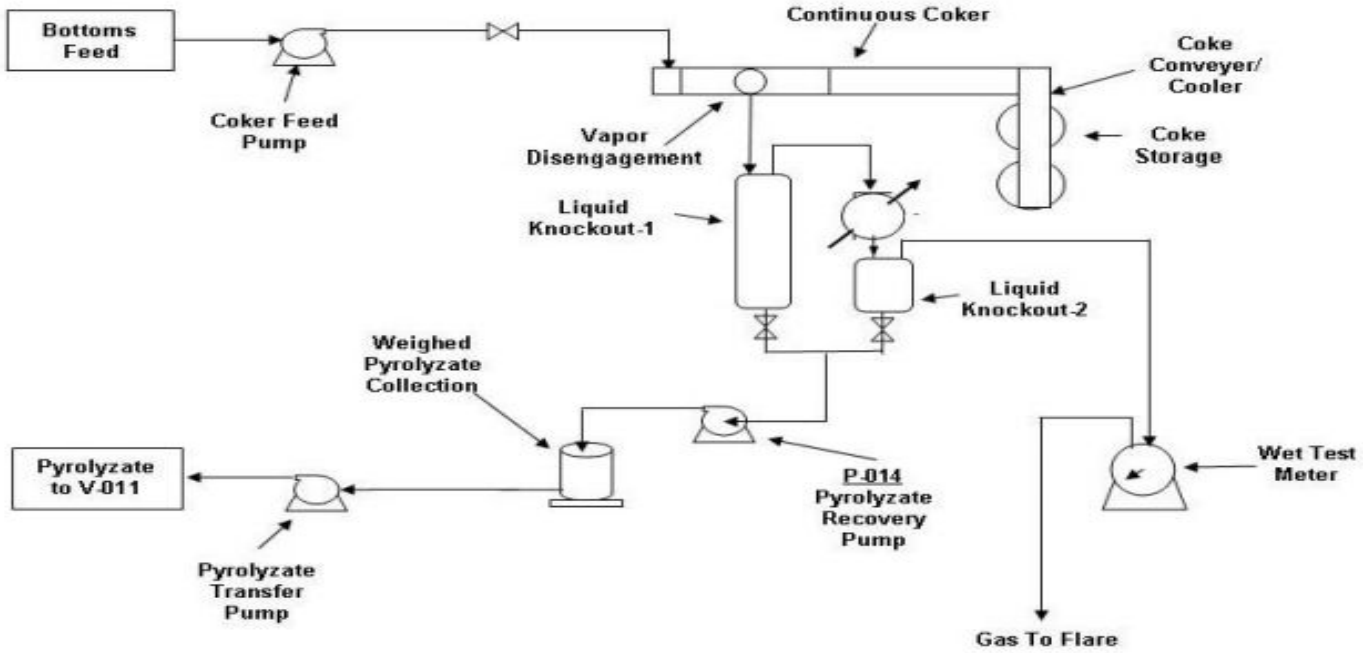
Table 8. Properties of the DRU Overhead Naphtha Fractions as Function of Sweep Gas and Space Velocities

Property	High Space Velocity		Lower Space Velocity	
	CO_2	CH_4	CO_2	CH_4
Yield, wt%	8.5	8.0	8.8	7.3
Composition, vol%				
Aromatics	16.0	14.1	19.7	15.5
Olefins	29.0	33.3	26.7	29.5
Saturates	55.0	52.6	53.7	55.0
Bromine Number, g Br_2/100 g	46.2	50.6	48.9	50.6


Sweep Gas
Make-up
Recovered
Diluent
Sour
Water
Diluent
Flash
Separator
Bitumen
Feed
Reactor
Furnace
Reactor
Liquid -
Vapor
Separator
Gas
Recovery
Unit
H_2S to
Sulphur Recovery
LPG
Hydrotreater
DRU
Bottoms


Electric
Flash
Preheater
Bitumen
Feed
Diluent
Storage
Flash
Separator
Sour
Water
Reactor
Heater
(Electric)
Overhead
Cooler
Cracked
Gas
Ovhd.
Storage/
Separator
Light
Product
LC
Recycle
Heater
Sweep
Gas
Reactor
DRU
Bottoms


Coke
Auger/Cooler
Vapor
Disengagement
2-inch
Screw
Barrel


Bottoms
Feed
Coker Feed
Pump
Continuous Coker
Coke
Conveyer/
Cooler
Vapor
Disengagement
Coke
Storage
Liquid
Knockout-1
Liquid
Knockout-2
Weighed
Pyrolyzate
Collection
Pyrolyzate
to V-011
Pyrolyzate
Transfer
Pump
P-014
Pyrolyzate
Recovery
Pump
Wet Test
Meter
Gas To Flare

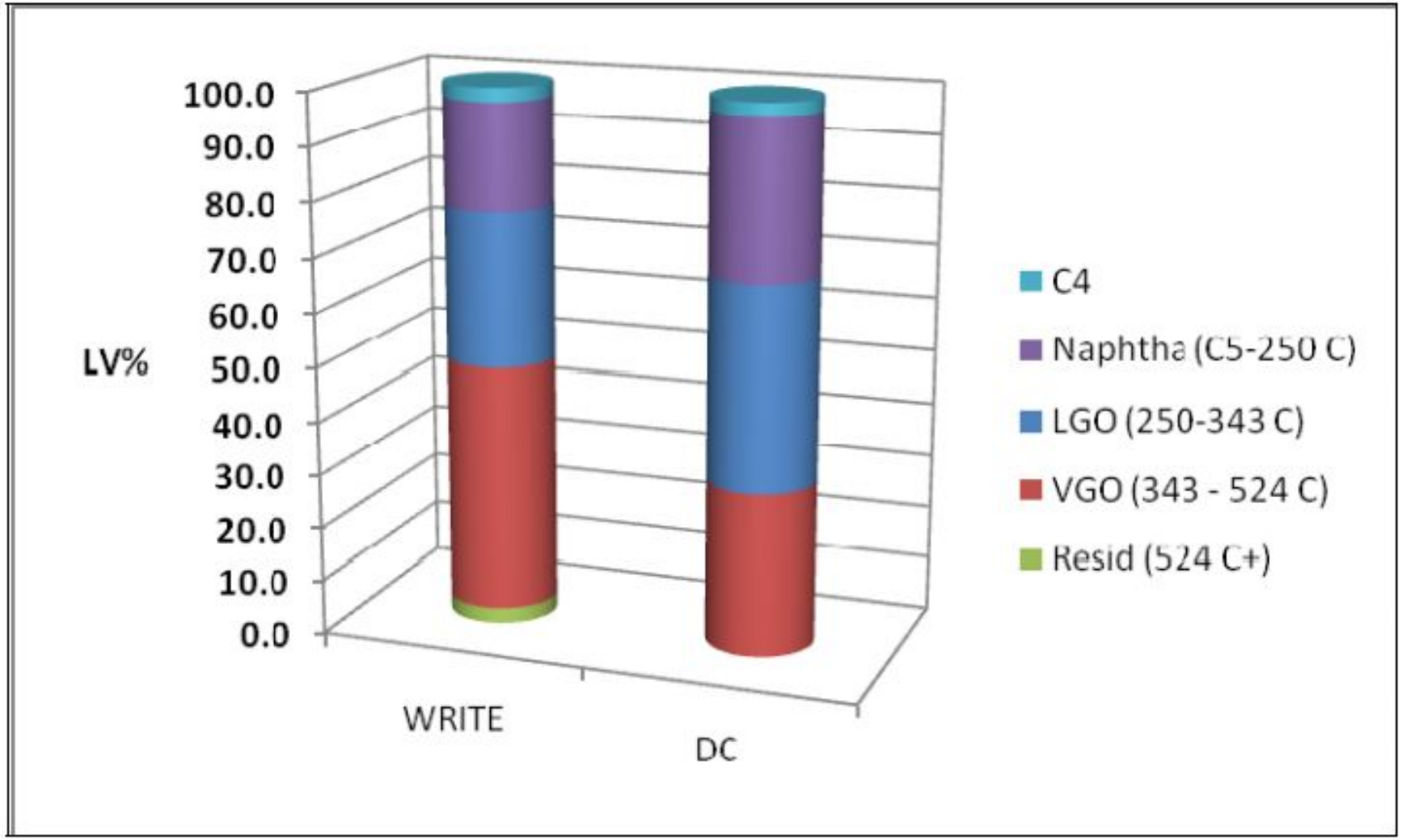


Figure 28. Comparison of boiling distributions from WRITE™ and Delayed Coking SCO.

	1	2	2-1	
CAPITAL COSTS	**Delayed Coking**	**WRITE™**	**difference**	**Comment**
Capital Cost (*MM$*)	4,092	3,123	-969	
$C /bbl Bitumen per day	40,917	31,226	-24%	WRITE™ is cheaper
Utility Estimates				
Variable Cost (*Per bbl Bitumen*)				
Make-up Water (*lb*)	158	127	-31	WRITE™ has lower water use
Make-up Diluent (*bbl*)	0.00925	0.00925	0	
CO_2 Emission (*lb*)	56.4	43.4	-13	WRITE™ has lower CO2
Catalysts & Chemicals (*$*)	0.040	0.046	0.006	
Fixed Cost (*k$/day*)	346	264	-82	WRITE™ has lower fixed costs