AS03-78ET13105

MASTER

THE UTILIZATION OF SHALE OIL AS A FEEDSTOCK FOR STEAM PYROLYSIS AND PETROCHEMICAL INTERMEDIATE PRODUCTION

DOE/ET/13105--T1

QUARTERLY TECHNICAL PROGRESS REPORT
FOR THE PERIOD JUNE - AUGUST 1978

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ABSTRACT

During the past quarter, 25 runs were made on a number of hydrotreated samples including a mildly hydrotreated simulated in-situ (1.35% N) and two moderately hydrotreated Tosco II (0.82% N and 1.55% N) distillates. The results are, in general, consistant with previous results which indicated an increase in olefins yield as the severity of hydrogenation increased. The olefins yields for the simulated in-situ oil were greater than those for the Tosco II oil for oil hydrogenated to comparable severities. The moderately hydrogenated Tosco II oil exhibited gasification tendencies at severe pyrolysis conditions, similar to the severely hydrogenated Tosco II oil.

Correlational efforts were continued in using the propylene yield versus severity factor, and the yields of all major gas components versus proplyene to ethylene ratio as a means of correlating pyrolysis yields. The efforts were extended to the hydrogenated simulated in-situ and Tosco II distillates.

Objective and Scope of Work

Petrochemical utilization of oil shale has long been considered, but only recently has the volume of petrochemical demand reached a level where it can affect the overall economics of utilization of liquid hydrocarbons. Production of light olefin and aromatic intermediates by pyrolysis appears an attractive method to avoid the hydrogenation catalyst poisoning effects of nitrogen. The program investigates five samples on each of the two crude shale oils: (1) the "whole" crude shale oil, (2) a vacuum distillate of the crude shale oil, (3) a mild hydrogenation of the distillate, (4) a deeper hydrogenation of the distillate, and (5) a severe hydrogenation of the distillate to produce a synthetic crude shale oil with essentially zero nitrogen content.

The research is divided into five major tasks:

Task 1. Equipment design and construction, samples of the two types of crude oil obtained and prepared for testing and hydrogenation

Task 2. Hydrogenation of Samples

Task 3. A. Experimental Measurements on Non-Hydrogenated Samples

B. Experimental Measurements on Hydrogenated Samples

Task 4. Analyses and Measurements on Feedstocks and Products

Task 5. Data Correlation

Task 1: Equipment Design and Construction

No modifications to the experimental equipment were made this quarter.

Task 2: Hydrogenation of Samples

Hydrogenation of Tosco II and simulated in-situ distillates were previously completed and the results were discussed in an earlier Progress Report.

Task 3: Experimental Measurements on Non-Hydrogenated and Hydrogenated Samples

Twenty-five experimental runs were completed during this quarter:

5 on Sample 6201, the mild severity hydrogenated simulated in-situ oil (1.35% N) = Run 30-34

9 on Sample 6206, the medium severity hydrogenated Tosco oil (0.82% N) = Run 35-43

9 on Sample 6205, the mild severity hydrogenated Tosco oil (1.55% N) = Run 44-52

1 on n-octane to check reproducibility with other investigators

1 on a high severity hydrogenated sample oil from the Paraho retort process

Detailed experimental results for each run are included in the appendix.

Table 1 is a compilation of selected product results of experimental runs of Sample 6201. Runs were made at low residence time for temperatures of 1308, 1407, 1497, and 1546 F. Increasing temperature at low residence time resulted in increased ethylene production. Propylene and butylene production increased, then decreased. Runs were made at medium residence time for temperatures of 1305, 1412, and 1507 F. Olefin production followed expected trends. A run was made at high residence time at 1409 F. No gasification tendencies were observed with this mild severity hydrogenated sample.

Results of experimental runs on Sample 6206 are summarized in Table 2. For this medium severity hydrogenated Tosco vacuum distillate, runs were made at low residence time for temperatures of 1301, 1407, 1508, and 1548 F. Ethylene production increased with temperature, but dropped at the highest temperature. Runs were made at medium residence time for temperatures of 1315, 1402, and 1511 F, resulting in expected trends in product yields. Two additional runs were made, one at high residence time and 1411 F, and

one at low steam-oil mass ratio and 1579 F. With this Tosco sample, runs 38, 42, and 43 at high pyrolysis severity, gasification tendencies (high hydrogen and carbon oxide production) were observed.

The last hydrogenated vacuum distillate studies was sample 6205, the mild severity Tosco oil. Experimental results for selected products are summarized in Table 3. Runs were made at low and medium residence time for approximate temperatures of 1300, 1400, and 1500 F. Additional runs at high residence time and 1400 F, and at low steam-oil ratio, high residence time, 1500 F were also completed. Ethylene production increased with temperature, and propylene ad butene yields followed expected trends. For sample 6205, no evidence of gasfication in the operating range studied was observed.

A run was made with n-octane feedstock to check the consistancy of experimental results of the CSM pyrolysis system with the results of other investigators. The results shown in Table 4 are compared with published results from investigations at the University of Pittsburgh (1). The product yields compare closely for all components except ethylene and propylene. The CSM light olefin yield is higher than the Pitt yields. The difference is due to utilization of steam as a carrier medium in the CSM experiment whereas Pitt apparently did not. Steam has been reported by other investigators to be a promoter of light olefin production in pyrolysis.

A high severity hydrogenated (0.04% N) sample of oil from a Paraho retort has been obtained. The quantity of Paraho sample is much larger than the hydrogenated Tosco and NTU vacuum distillates. Plans call for investigating the pyrolysis characteristics of the Paraho oil to check for gasification tendencies. One run has been made at low residence time at 1411 F, which produced:

	wt.% of feed	
C_2 =	27.4	
C_3 =	15.2	54.0
C_4 =	11.4	

In order to determine the effect of the feedstock type on pyrolysis yields, the results of 89 pyrolysis experimental runs on whole oil, vacuum distillate, and mild, medium, and high severity hydrogenated vacuum distillates of Tosco and simulated in-situ shale oils have been represented as a function of a previously utilized pyrolysis severity factor defined as:

$$S = T\,\theta^{0.06}\,R^{0.05}$$

where

S = severity function

T = temperature, ^{o}F

θ = residence time, sec

R = steam to hydrocarbon mass ratio

Two series of figures show the relationship between feedstock and yield of light olefin products. The total olefin, ethylene, propylene, and butene production for each individual oil is shown in Figures 1 - 10. This product information is then represented in Figures 11 - 18 to show production of each olefin for all samples of each shale oil. The general trends in Figures 11 - 18 are apparent; for both the Tosco and simulated in-situ samples, as severity of hydrogenation increases, the yield of light olefins increases with the exception of the high severity pyrolysis of the most severly hydrogenated samples, where the significant drop in olefin production is the results of sample gasification. Specific details of olefin yields can be seen in the individual figures.

Although the severity factor used above is not the optimum, it allows us to observe the effect of feedstock type on pyrolysis yields. In Task 5, we discuss our ongoing correlation efforts aimed at determining an optimum

pyrolysis severity factor.

Key to Figure 1 - 10

top line	x	total olefin
	+	ethylene
	Δ	propylene
bottom line	o	butenes

Key to Figure 11 - 18

top line	◘	high severity hydrogenated vacuum distillate
	o	medium severity hydrogenated vacuum distillate
	Δ	low severity hydrogenated vacuum distillate
	+	vacuum distillate
bottom line	x	whole oil

NTU = Laramie simulated in-situ shale oil

Table 1 - Summary of Pyrolysis Results for a Hydrogenated (1.35% N) Simulated In Situ Vacuum Distillate

	# 29	#28	#27	#34
	1308F (1348)	1407F (1447)	1497F (1556)	1546F (1609)
temp ↔	0.40 sec.	0.41 sec.	0.40 sec.	0.40 sec.
	0.76 ratio	0.71 ratio	0.74 ratio	0.86 ratio
	Wt % feed	Wt % feed	Wt % feed	Wt. % feed
C_2 =	14.9	23.0	27.1	29.5
C_3 =	11.3 } 34.7	13.1 } 45.2	10.5 } 43.7	9.1 } 44.1
C_4 =	8.5	9.1	6.1	5.4
Res. time ↕	# 32	#30	#31	
	1305F (1377)	1412% (1490)	1507F (1597)	
	0.75 sec.	0.80 sec	0.73 sec.	
	1.15 ratio	0.74 ratio	0.84 ratio	
	Wt % feed	Wt. % feed	Wt. % feed	
C_2 =	17.5	26.1	25.0	
C_3 =	11.7 } 37.7	12.7 } 44.2	6.9 } 35.4	
C_4	8.4	5.3	3.6	

33

1409F (1487)

1.13 sec.

0.93 ratio

	Wt. % feed
C_2 =	21.2
C_3 =	9.1 } 35.5
C_4 =	5.2

Table 2 Summary of Pyrolysis Results for a Hydrogenated (0.82% N) TOSCO Vacuum Distillate

	#37		# 35		#36		#43	
	1301F (1336)		1407F (1463)		1508F (1576)		1548F (1603)	
	0:40 sec.	temp ⟷	0.43 sec	temp ⟷	0.42 sec.	temp ⟷	0.44 sec	
	0.83 ratio		0.67 ratio		0.69 ratio		0.69 ratio	
	Wt % feed		Wt % feed		Wt % feed		Wt % feed	
C_2 =	13.8		23.4		28.1		24.3	
C_3 =	9.3	29.6	12.6	44.5	10.1	44.2	7.1	35.2
C_4 =	6.6		8.5		6.0		3.9	

	#40	Res. time ↕	# 39	Res. time ↕	# 38
	1315F (1354)		1402F (1467)		1511F (1590)
	0.73 sec.		0.84 sec.		0.80 sec.
	0.85 ratio		0.70 ratio		0.72 ratio
	Wt. % feed		Wt % feed		Wt % feed
C_2 =	16.3		21.9		27.0
C_3 =	11.8	37.6	11.3	41.3	8.1	39.6
C_4 =	9.5		8.2		4.4	

	#41	#42
	1411F (1489)	1579F (1628)
	1.03 sec	0.59 sec.
	0.78 ratio	0.46 ratio
	Wt % feed	Wt % feed
C_2 =	26.2	28.7
C_3 =	12.7	46.3	7.0	39.2
C_4 =	7.5	3.6

Table 3 Summary of Pyrolysis Results for a Hydrogenated (1.55 %N) TOSCO Vacuum Distillate

#46	temp →	#45	temp →	#44	temp →	#52
1299F (1335)		1400F (1464)		1509F (1576)		1560F (1629)
0.40 sec		0.39 sec		0.40 sec		0.43 sec
0.77 ratio		0.73 ratio		0.73 ratio		0.73 ratio
Wt % feed		Wt % feed		Wt % feed		Wt % feed
C_2 = 15.1		C_2 = 22.7		C_2 = 25.3		C_2 = 28.1
C_3 = 9.5 } 31.0		C_3 = 12.9 } 44.9		C_3 = 9.3 } 40.3		C_3 = 7.9 } 40.4
C_4 6.3		C_4 = 9.2		C_4 = 5.5		C_4 = 4.4
↓ Res. time		↓ Res. time				
#50		#49		#48		
1298F (1363)		1400F (1471)		1501F (1588)		
0.85 sec		0.77 sec		0.76 sec		
0.73 ratio		0.78 ratio		0.75 ratio		
Wt % feed		Wt % feed		Wt % feed		
C_2 = 16.5		C_2 = 21.6		C_2 = 24.9		
C_3 = 11.3 } 35.7		C_3 11.2 } 39.7		C_3 = 7.7 } 37.0		
C_4 = 7.9		C_4 = 7.0		C_4 = 4.4		
		#51		#47		
		1402F (1470)		1498F (1585)		
		1.18 sec		1.42 sec		
		0.64 ratio		0.36 ratio		
		Wt % feed		Wt % feed		
		C_2 = 19.4		C_2 = 25.2		
		C_3 = 11.1 } 37.4		C_3 = 6.9 } 35.5		
		C_4 = 6.9		C_4 = 3.5		

Table 4

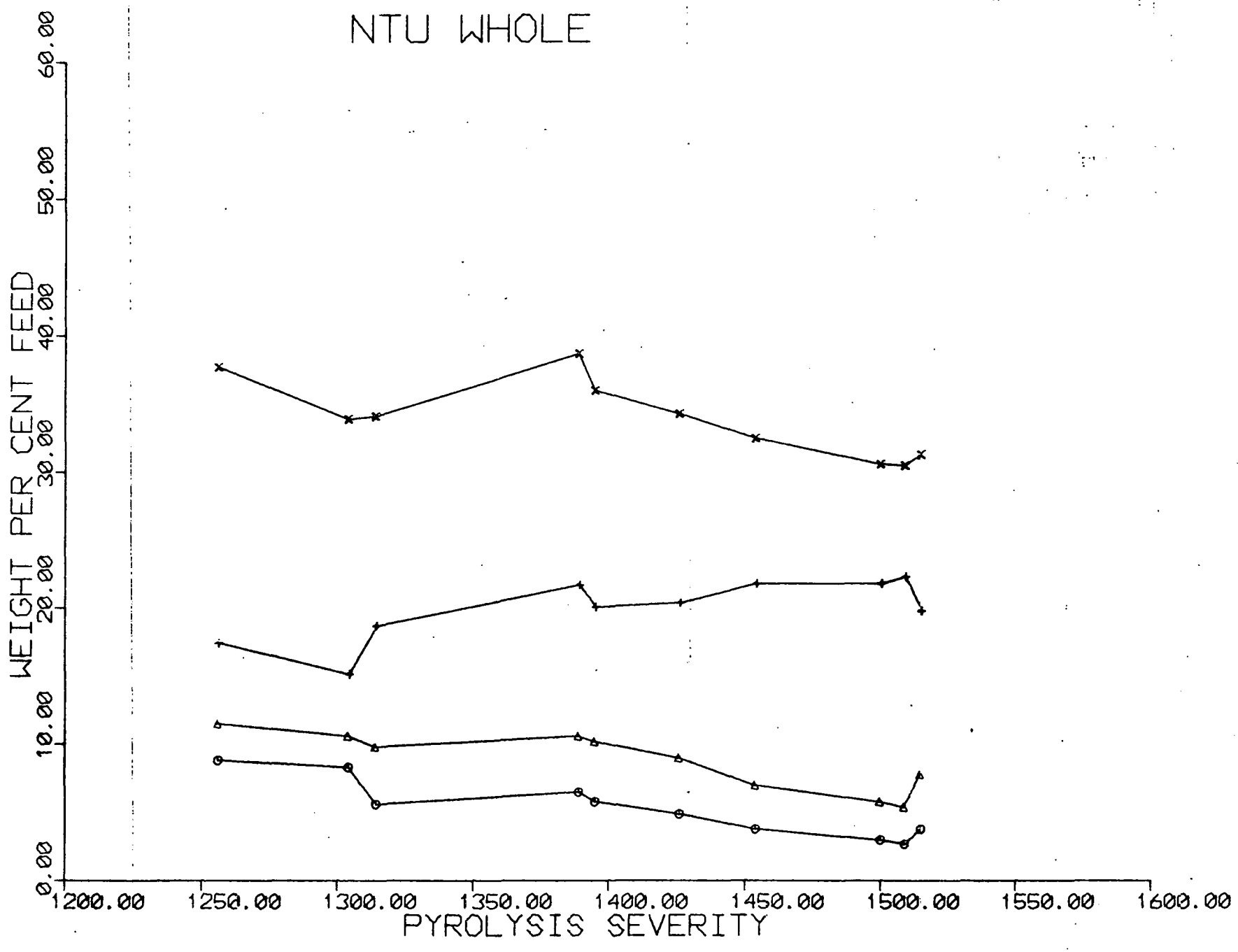
Results of Pyrolysis of n-Octane
(mole/100 mole feed)

	CSM 1323 F ave 1370 F max	Pitt 1292 F	Pitt 1337 F
H_2	32.0	32.0	40.2
CH_4	80.9	74.5	83.5
C_2H_6	24.8	34.0	35.2
C_2H_4	169.7	122.5	134.2
C_3H_8	2.1	5.7	5.5
C_3H_6	61.2	48.5	55.2
C_4H_{10}	0.7	1.4	0.3
C_4 olefins	26.5	28.1	30.4

Reference:

Y. T. Shah, E. B. Stuart, and K. D. Sheth, 1976, Coke Formation during Thermal Cracking of n-Octane: I&EC Process Des. Dev., V. 15, n.4, pp. 518 - 524.

Figure 1



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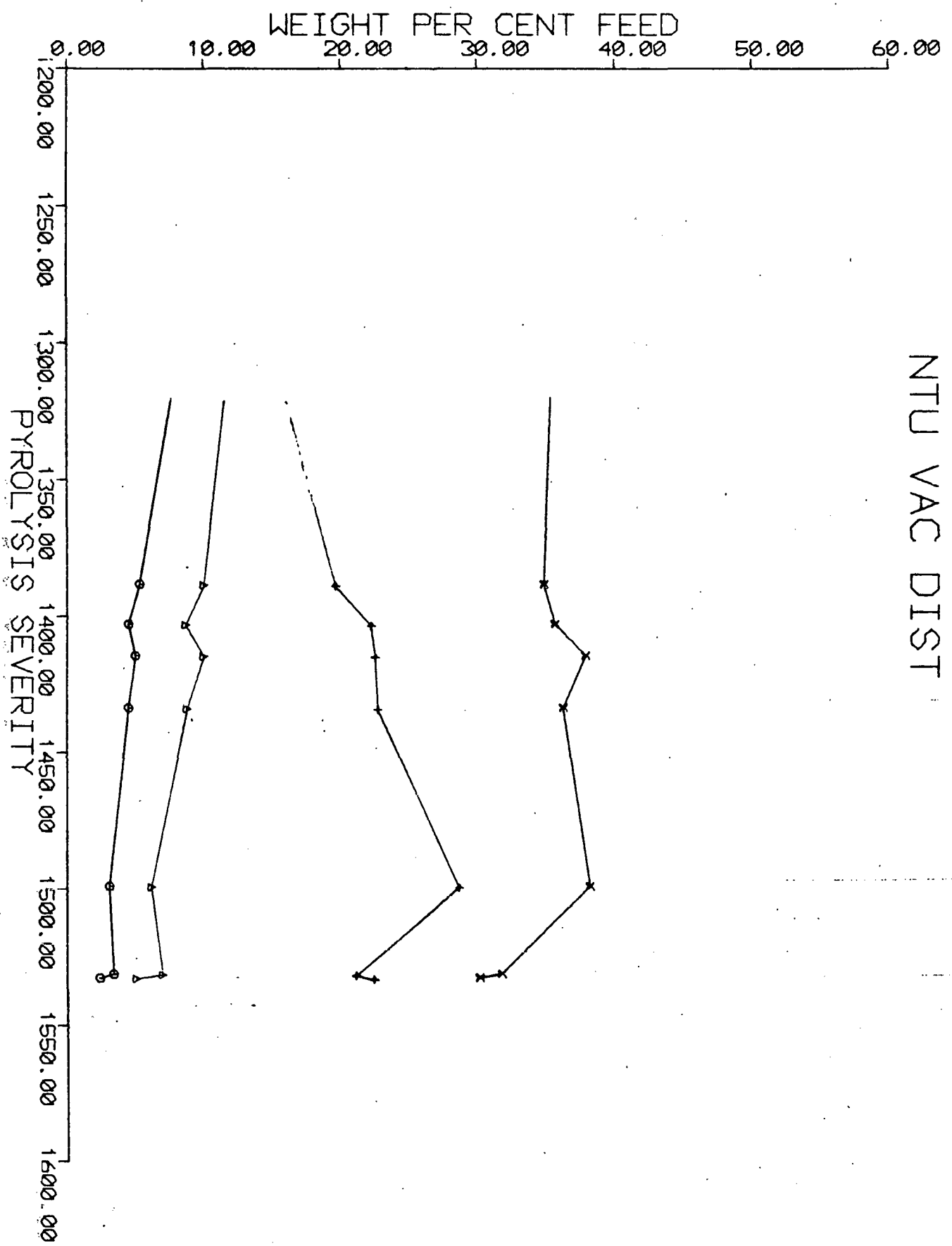
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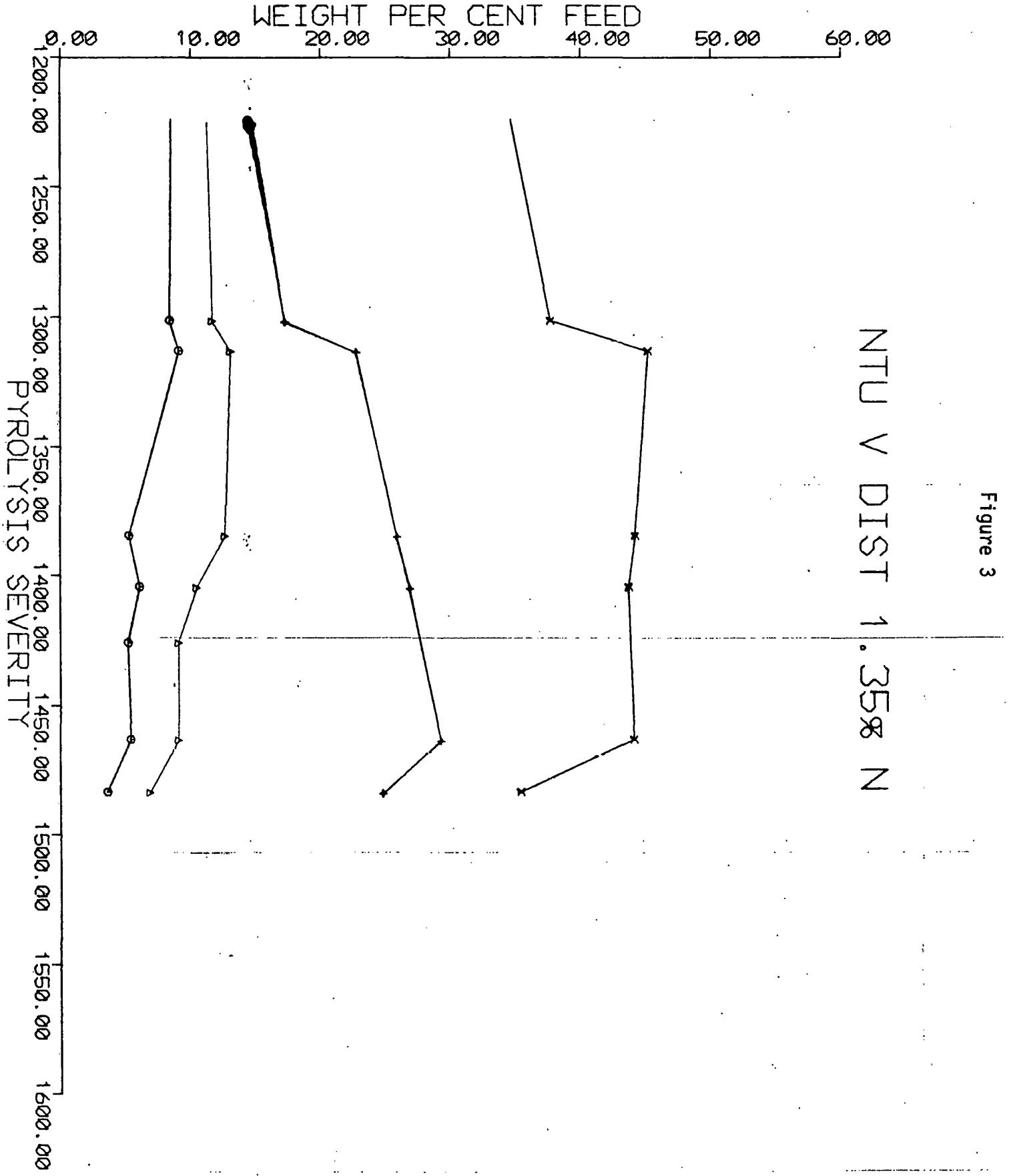
Figure 2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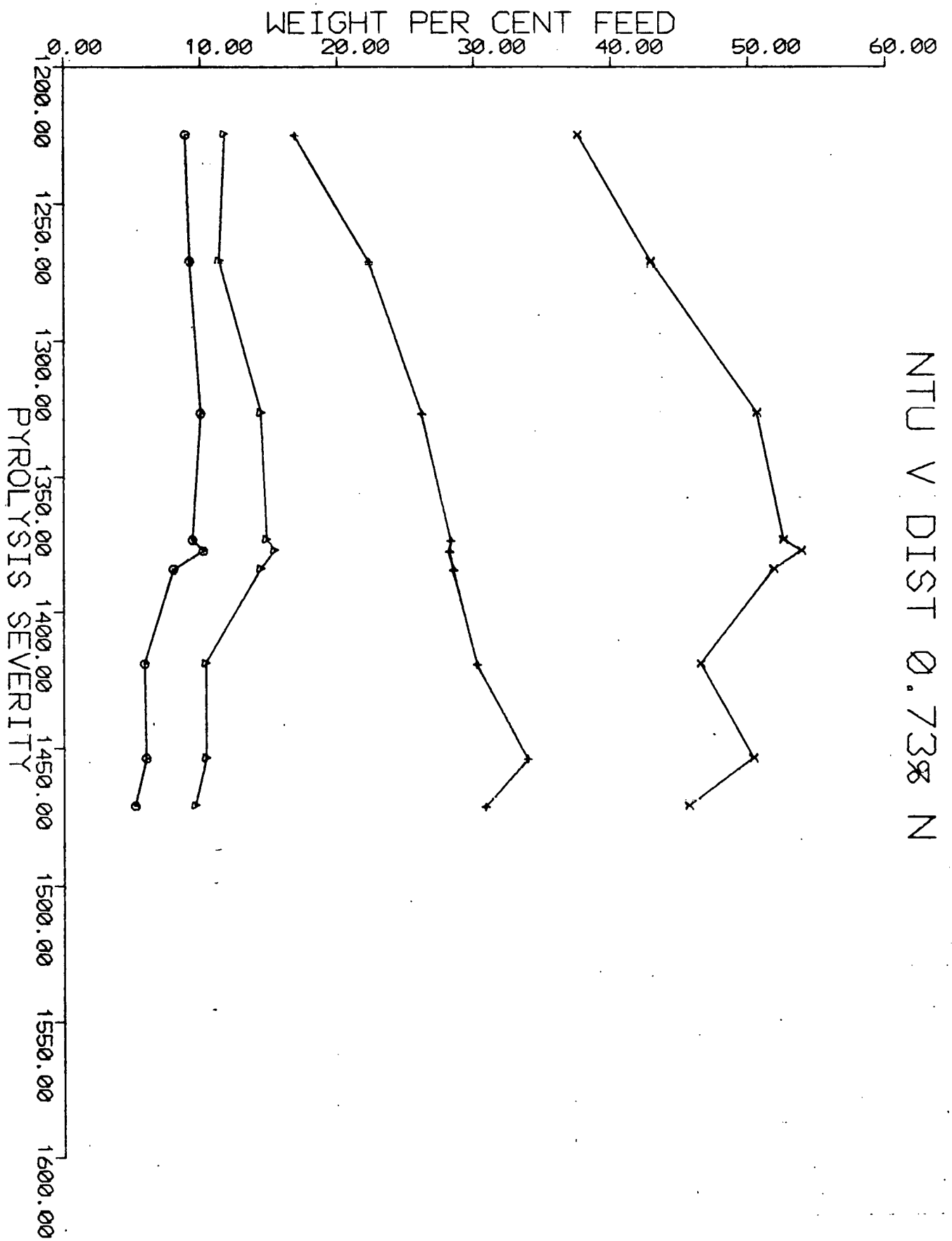
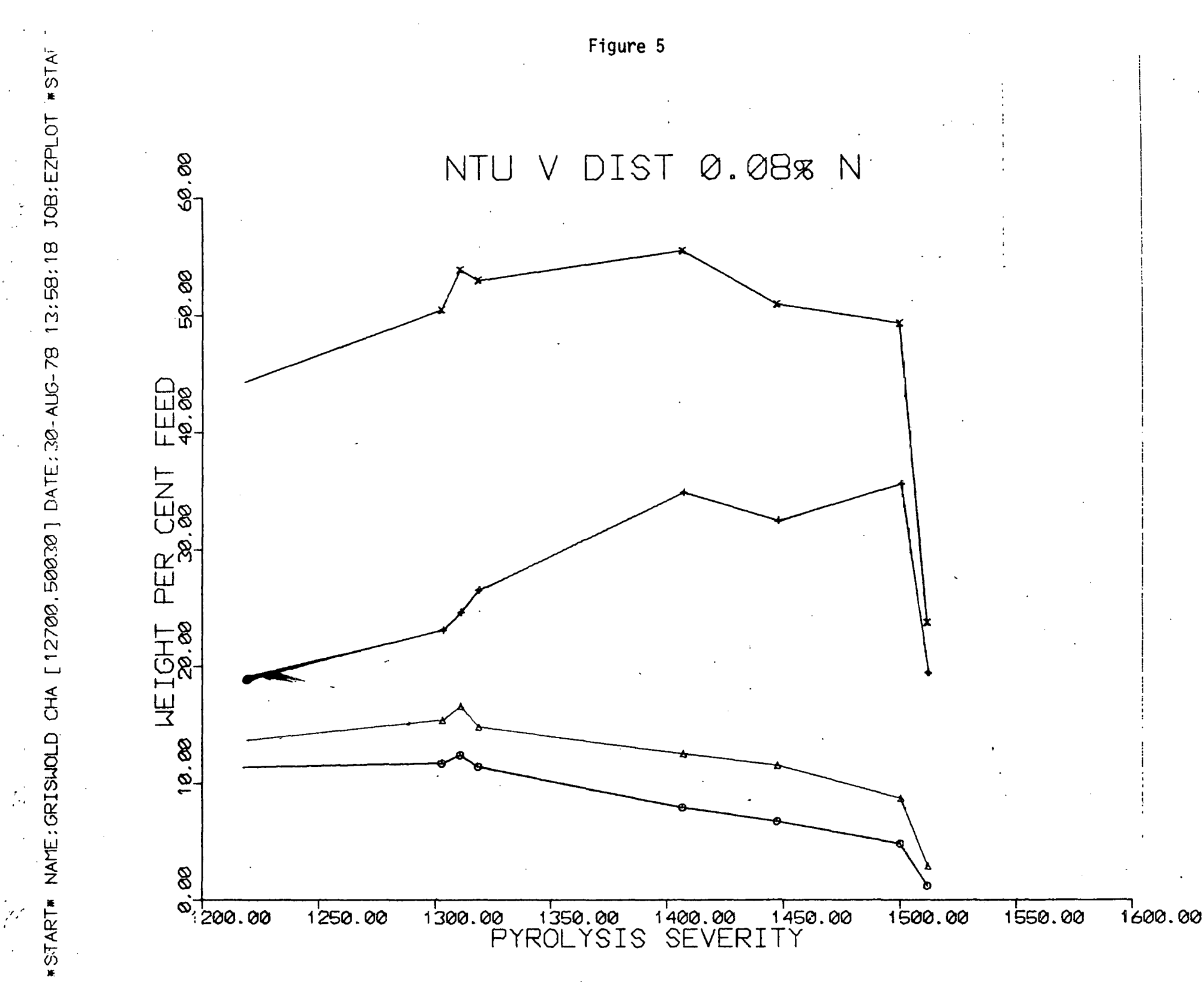


Figure 4

Figure 5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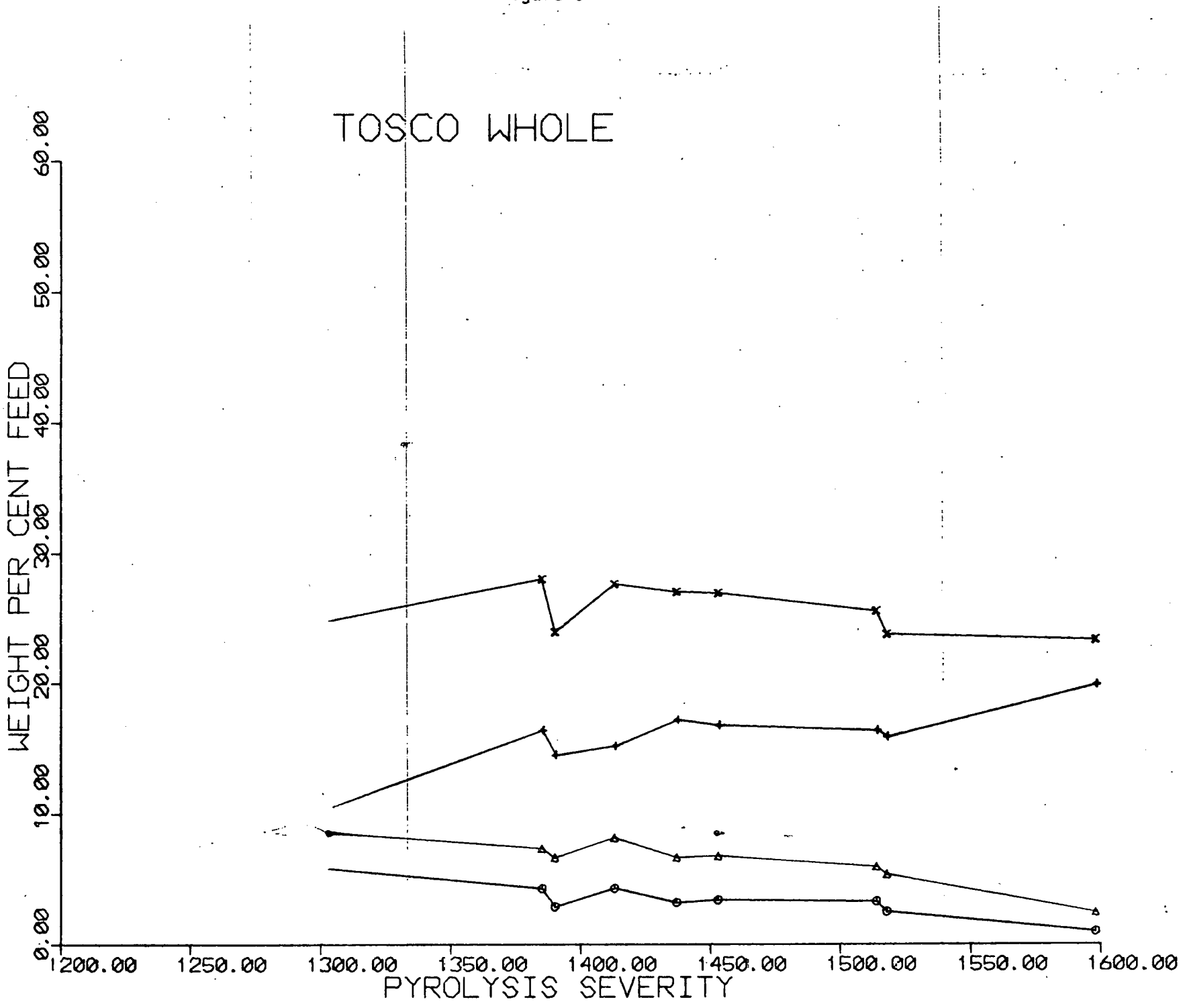

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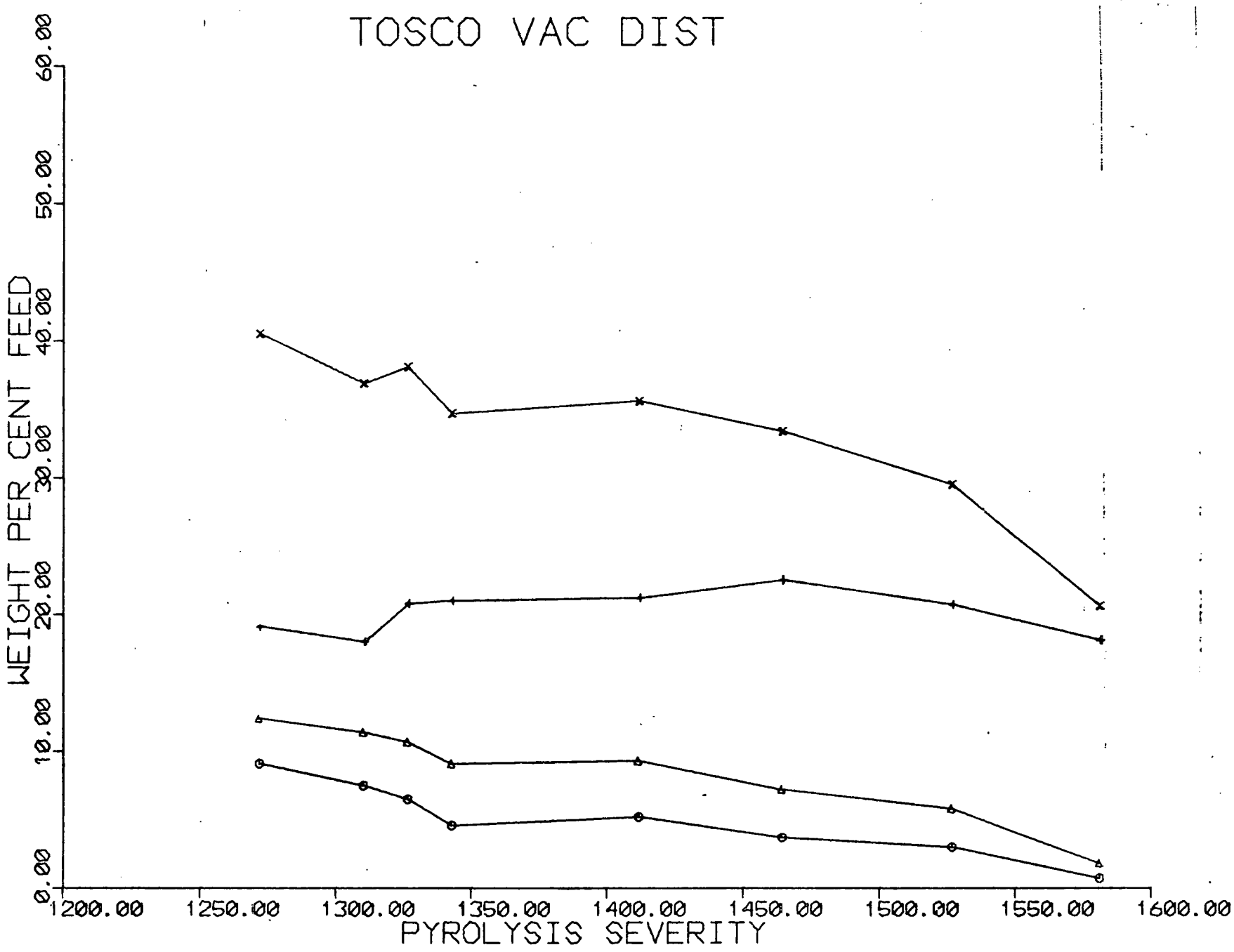

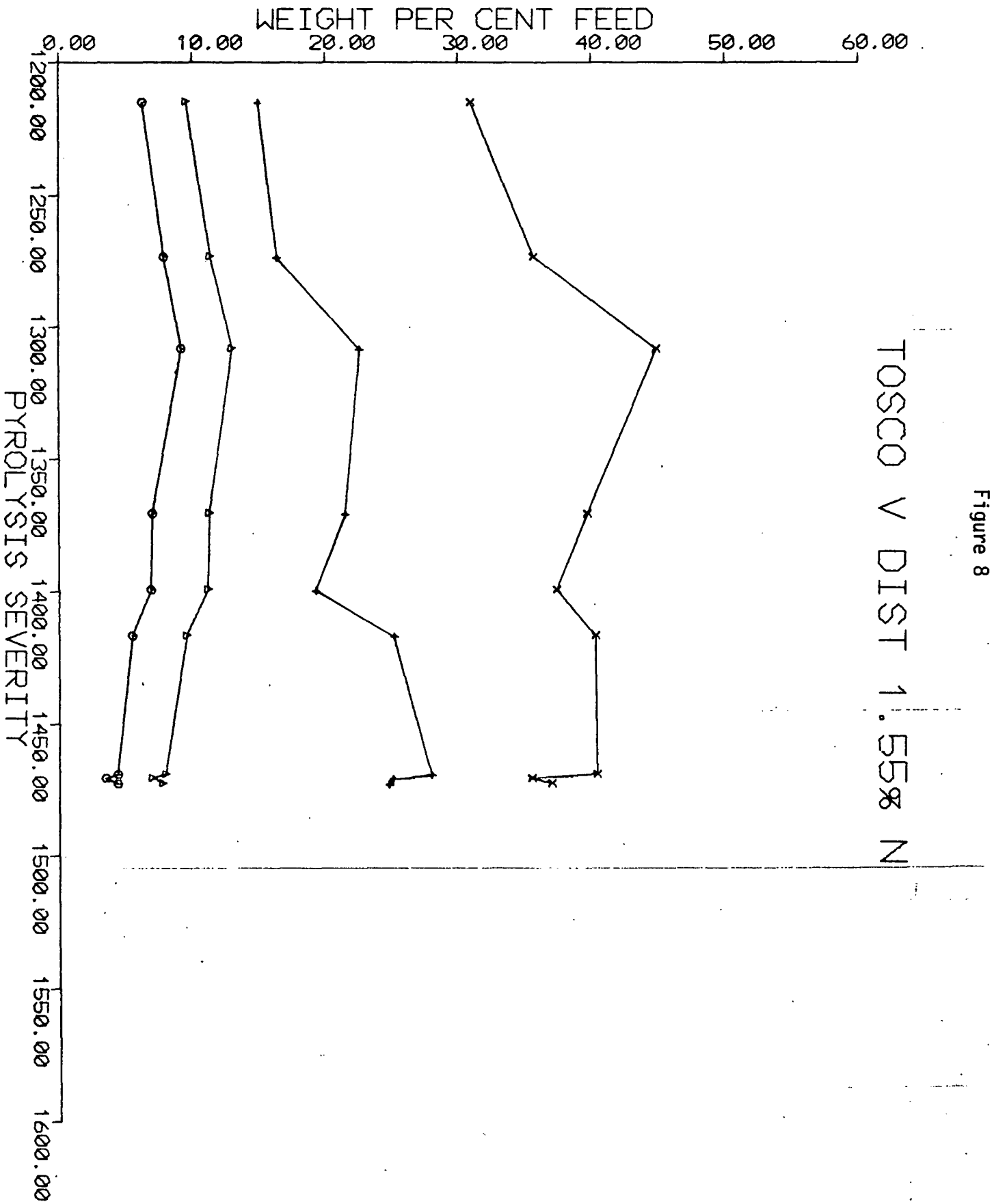
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Figure 8

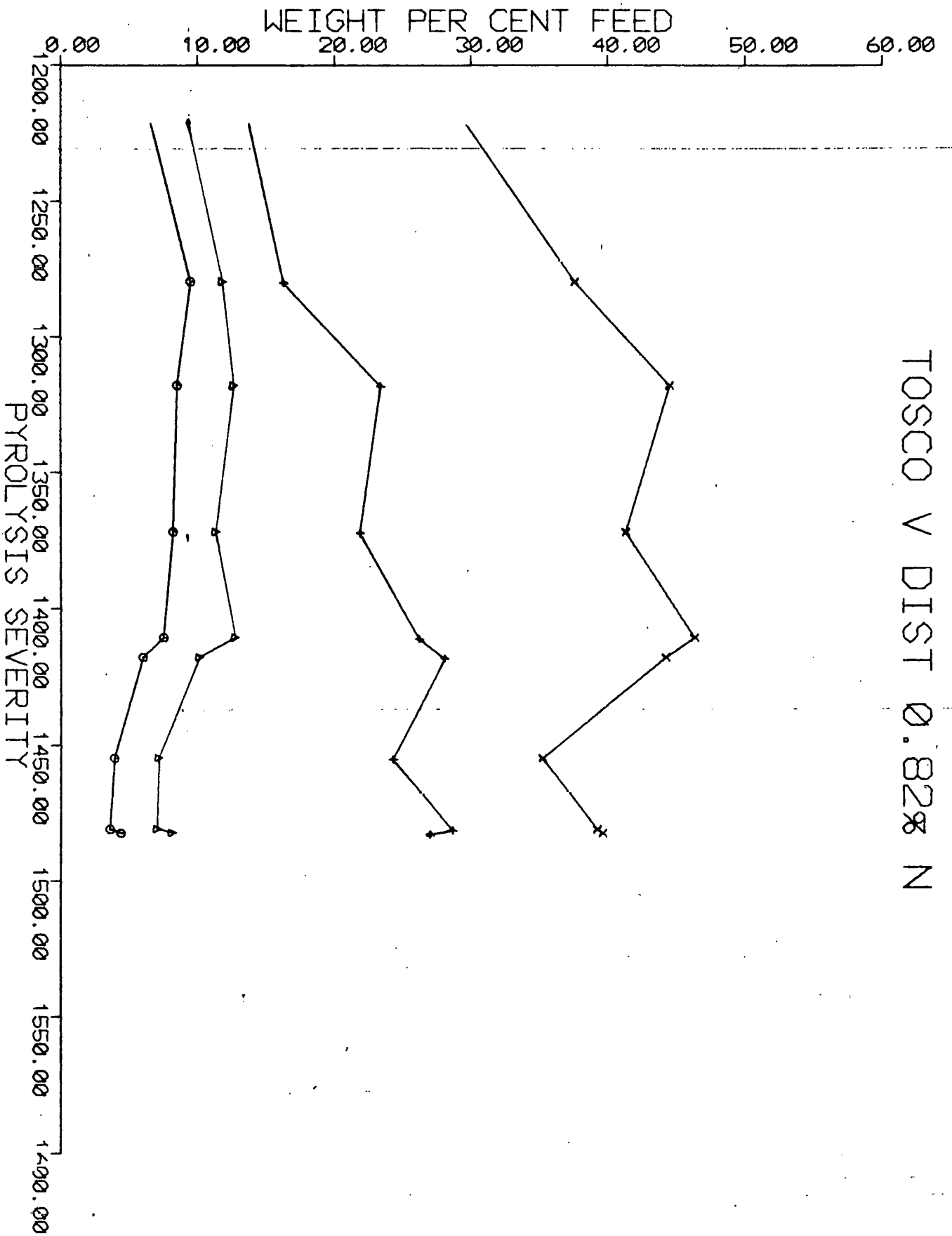
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Figure 9

Figure 10

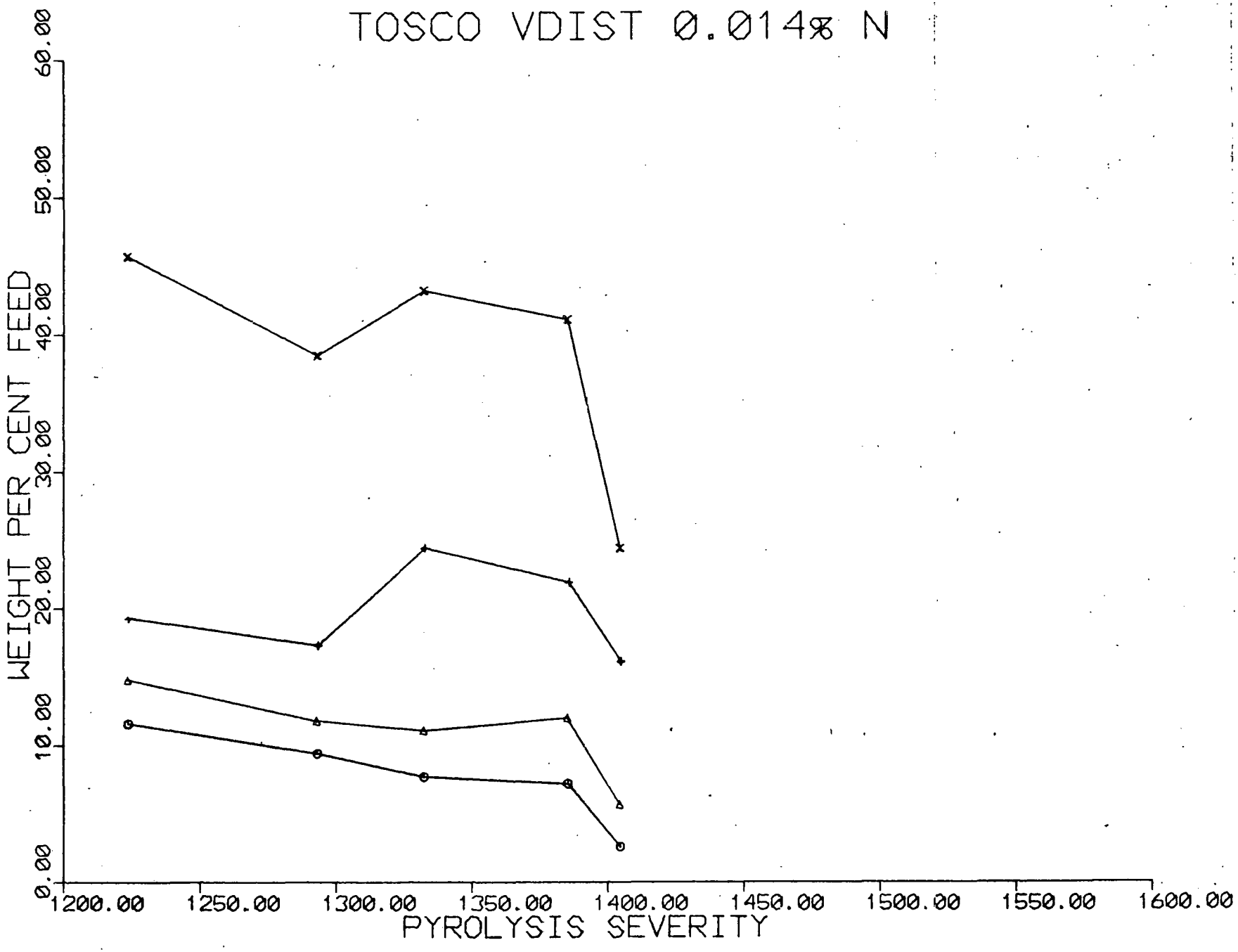

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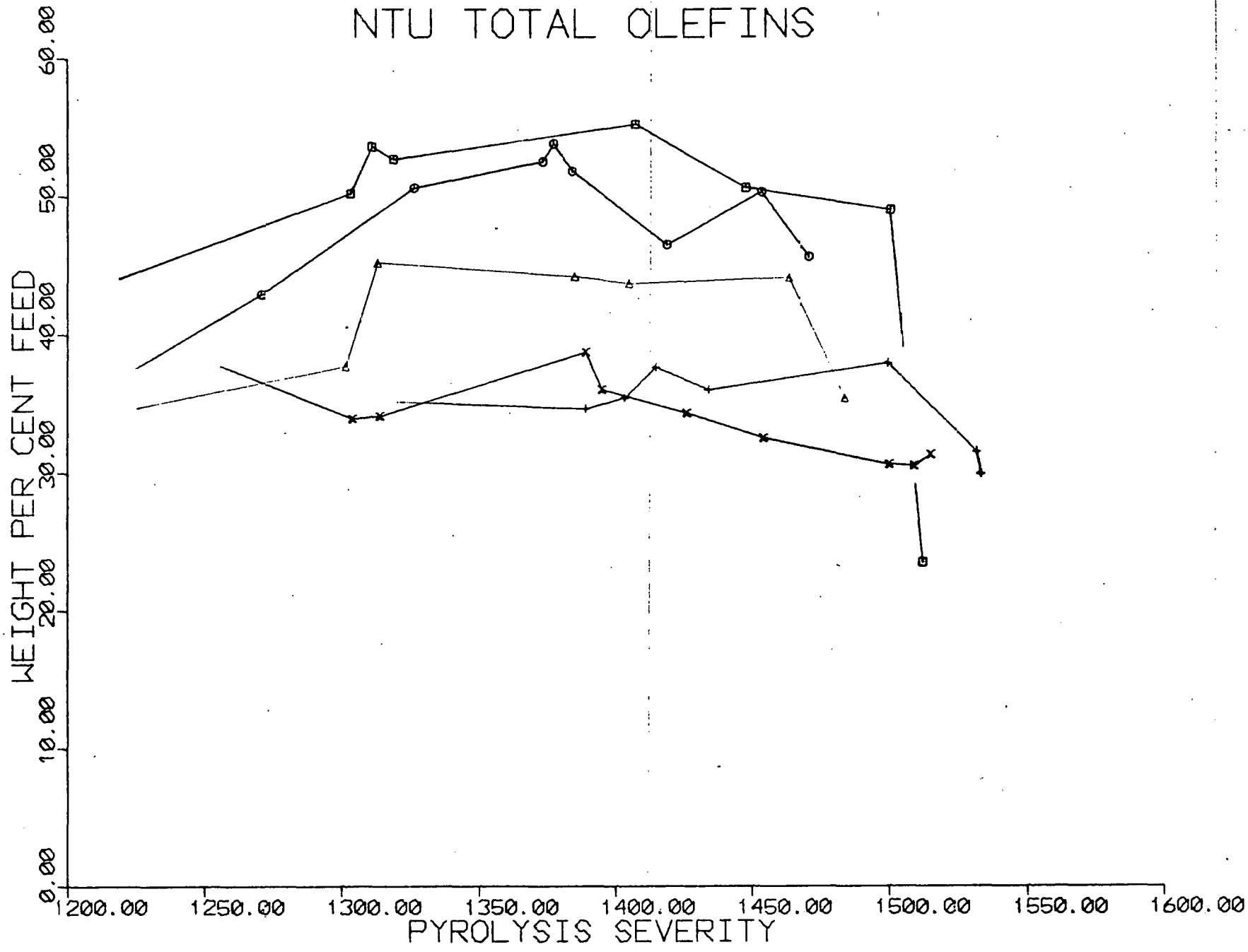
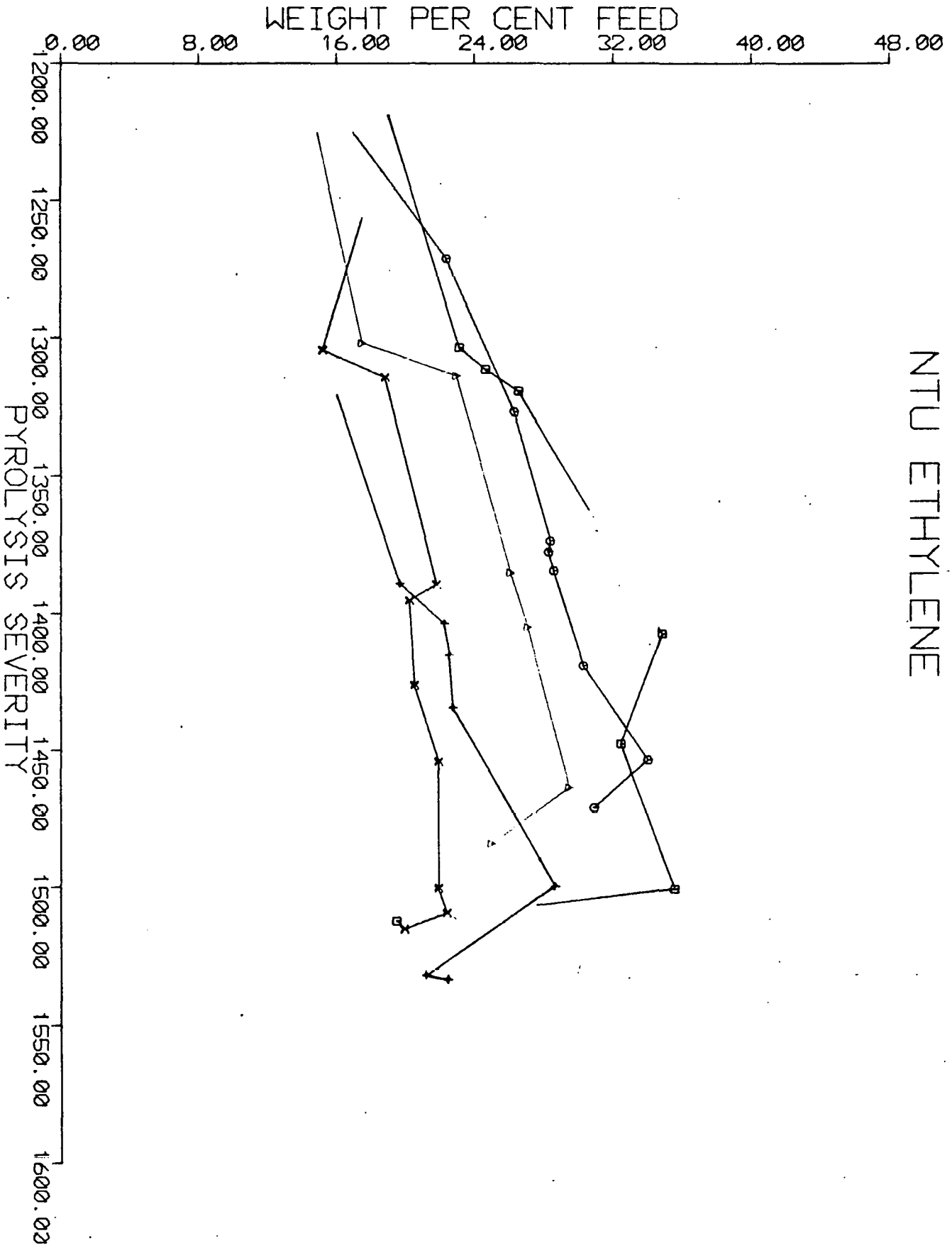
Figure 11

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NTU ETHYLENE

Figure 12

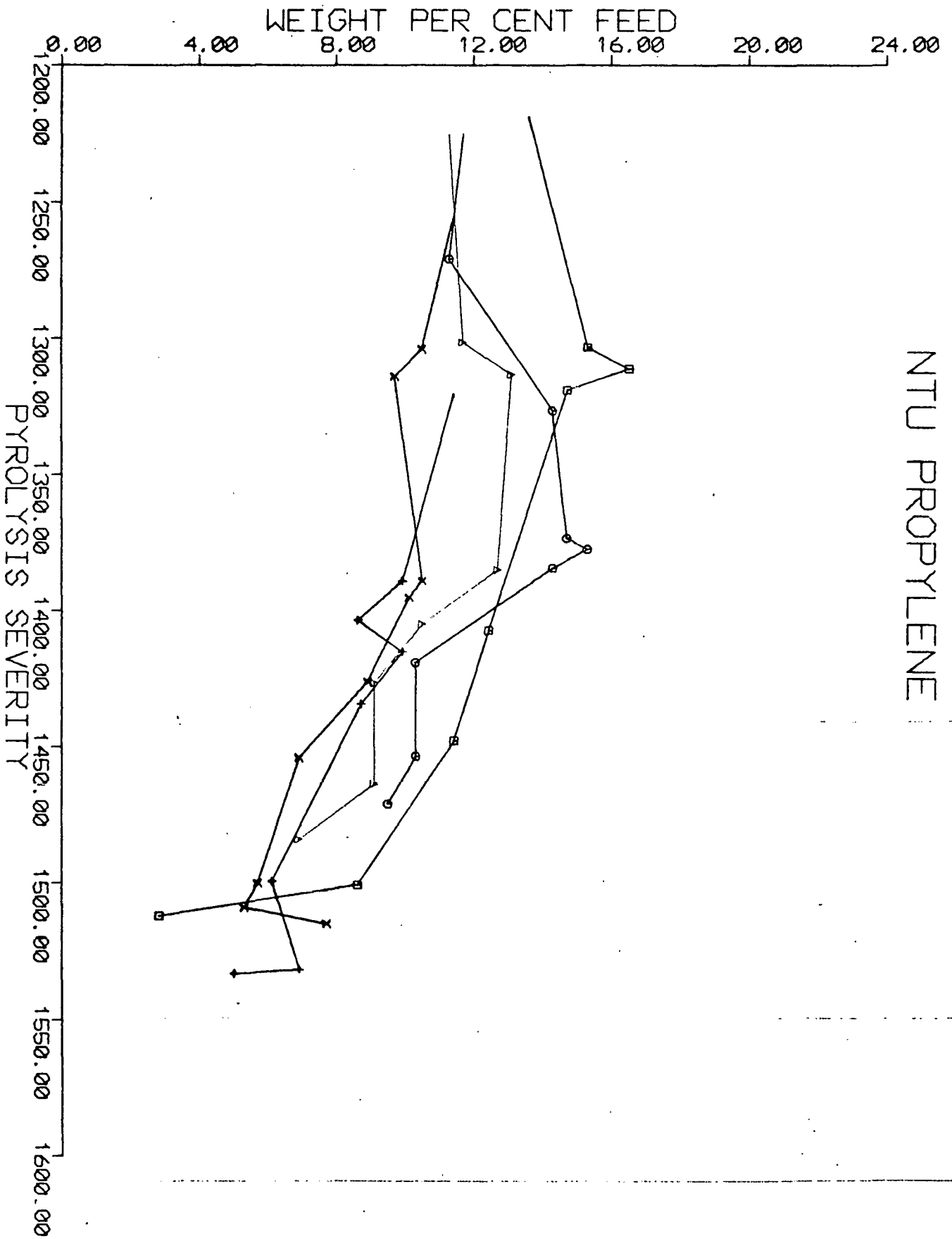
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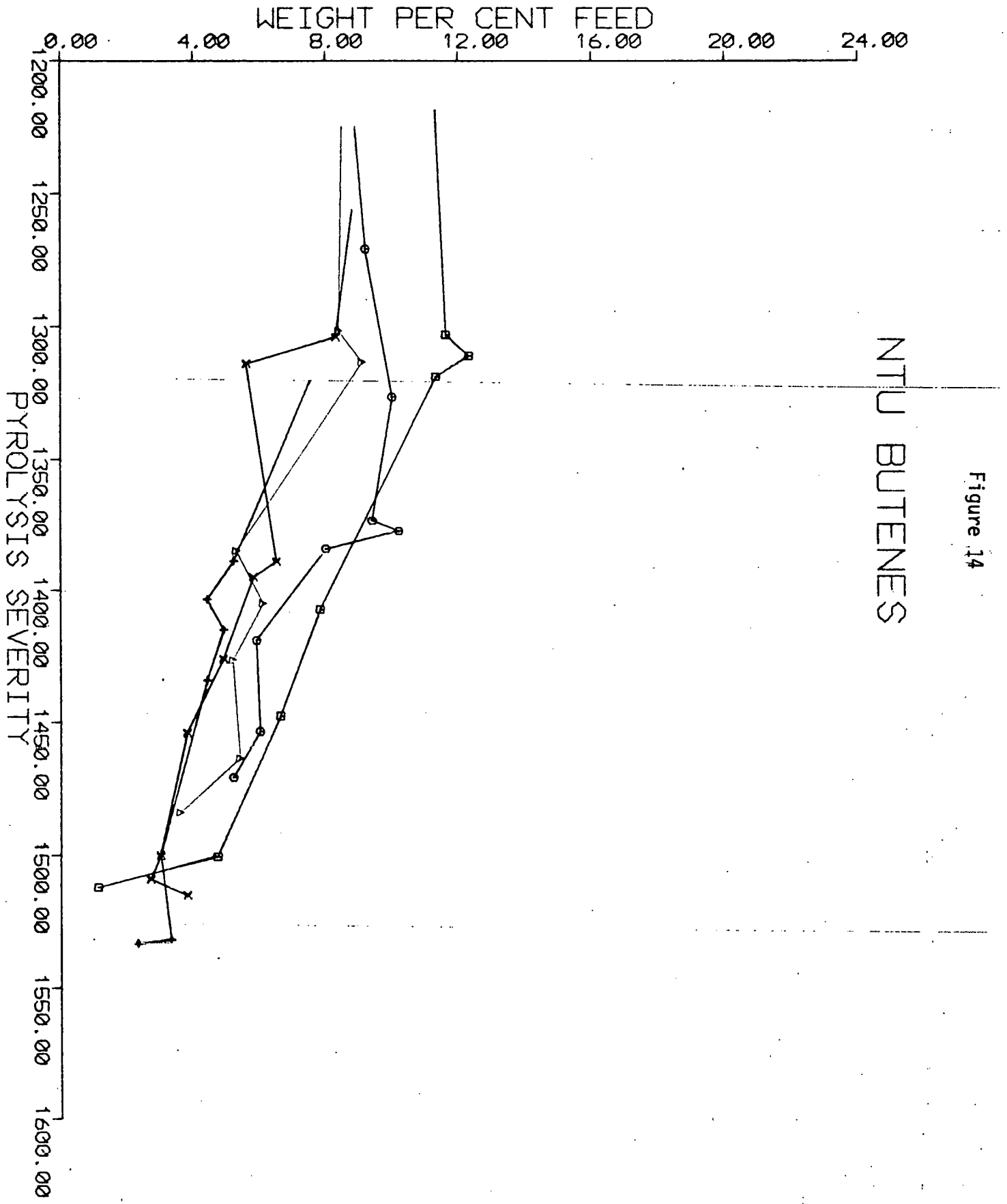
Figure 13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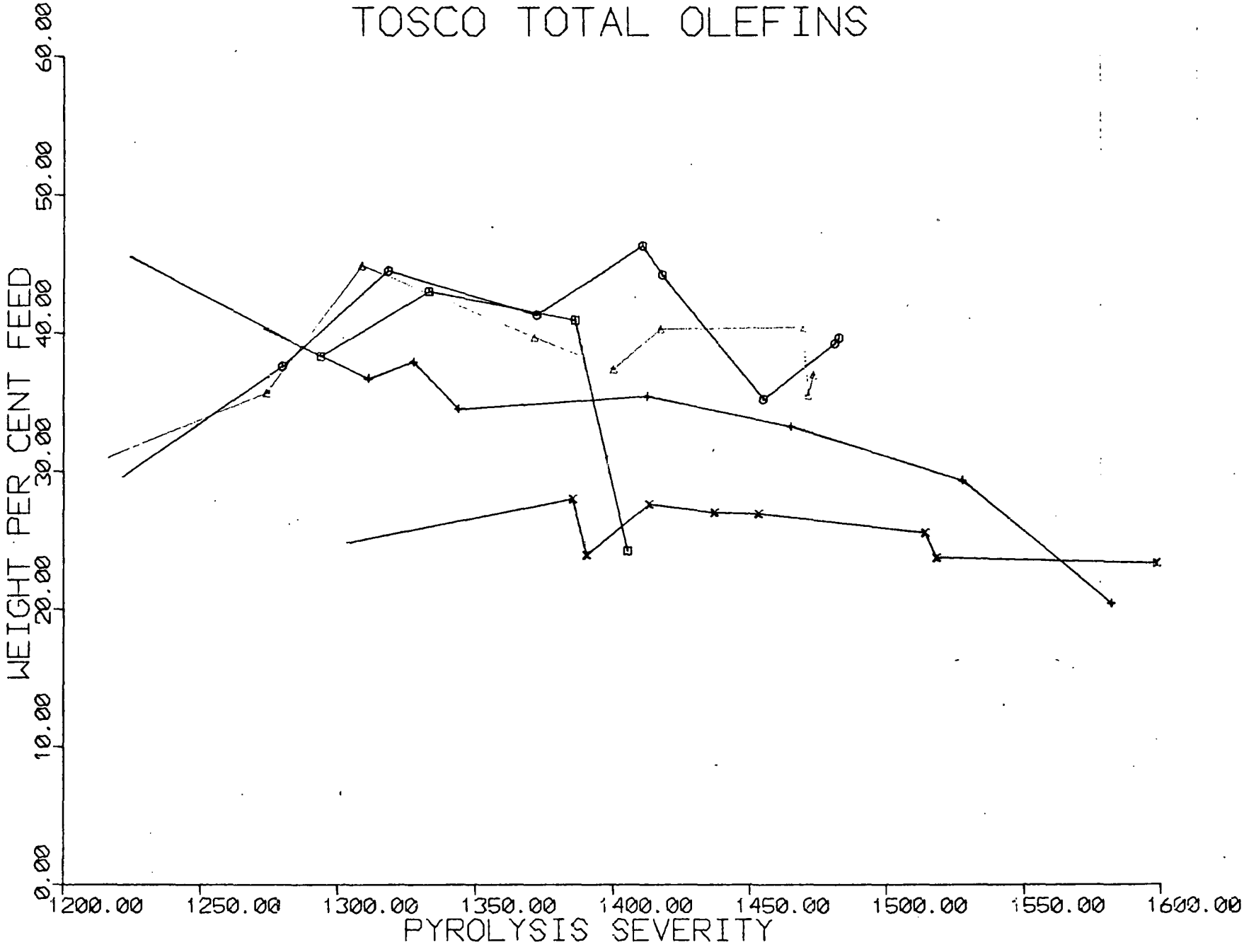
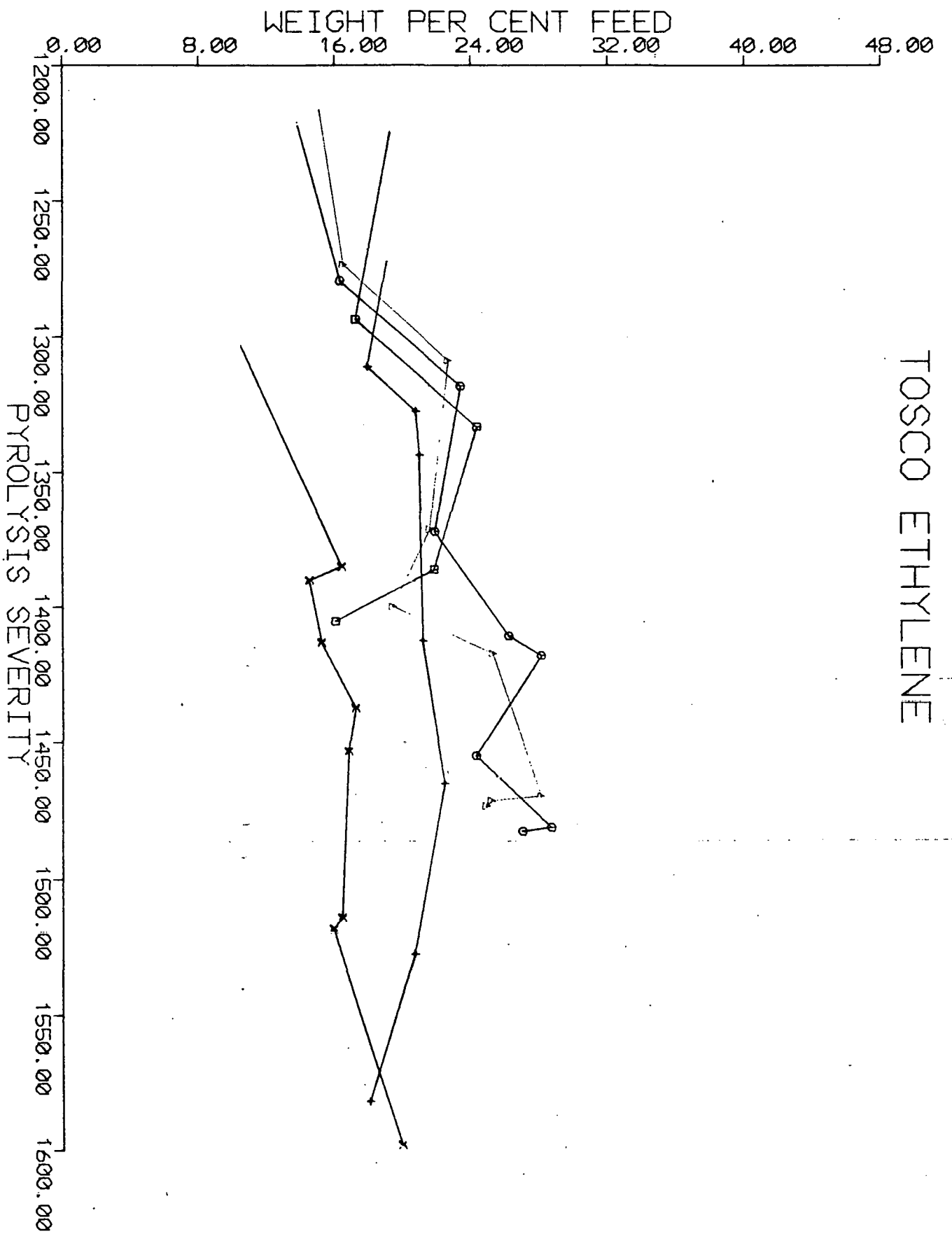
NTU BUTENES

Figure 14

Figure 15

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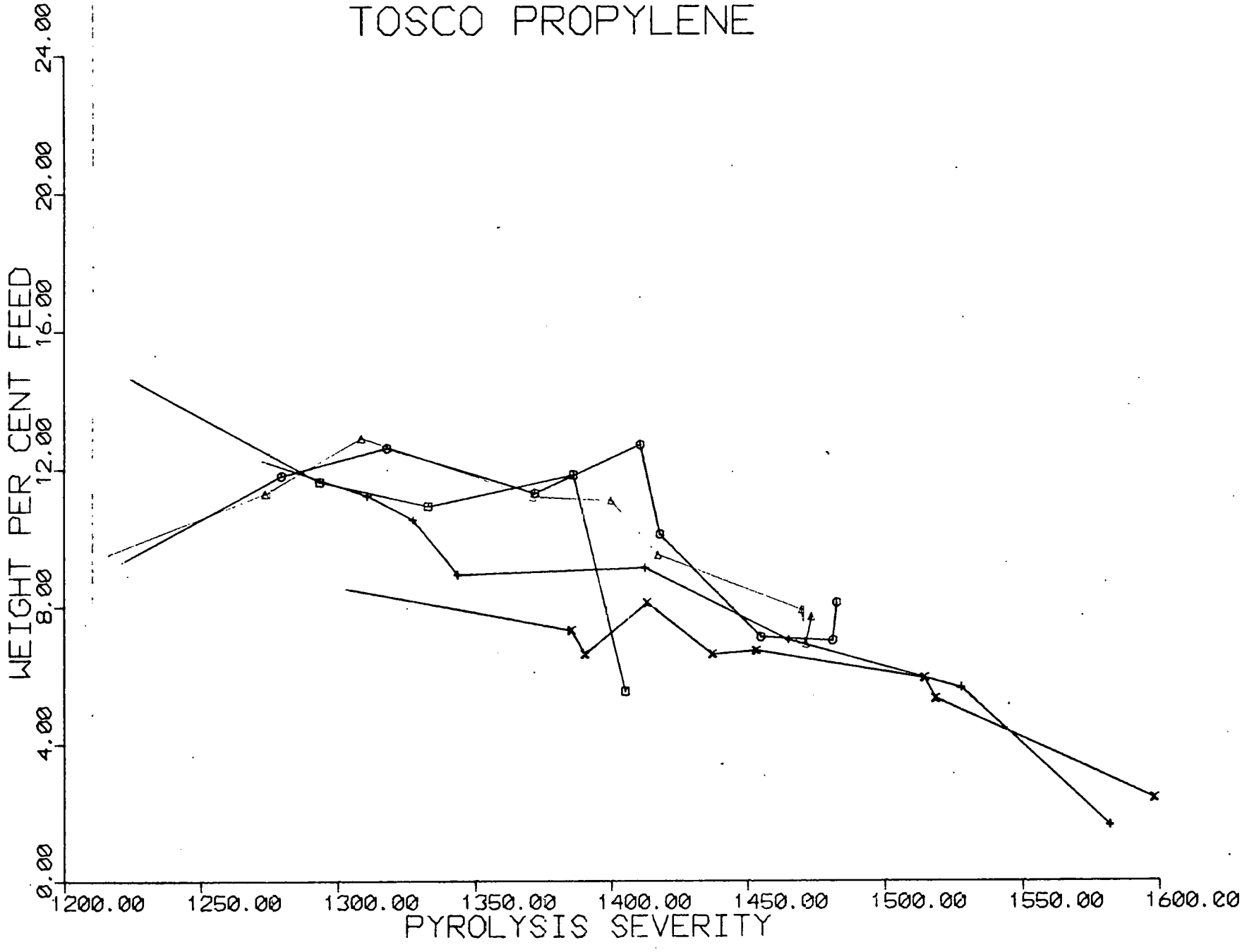
TOSCO ETHYLENE

Figure 16

Figure 17



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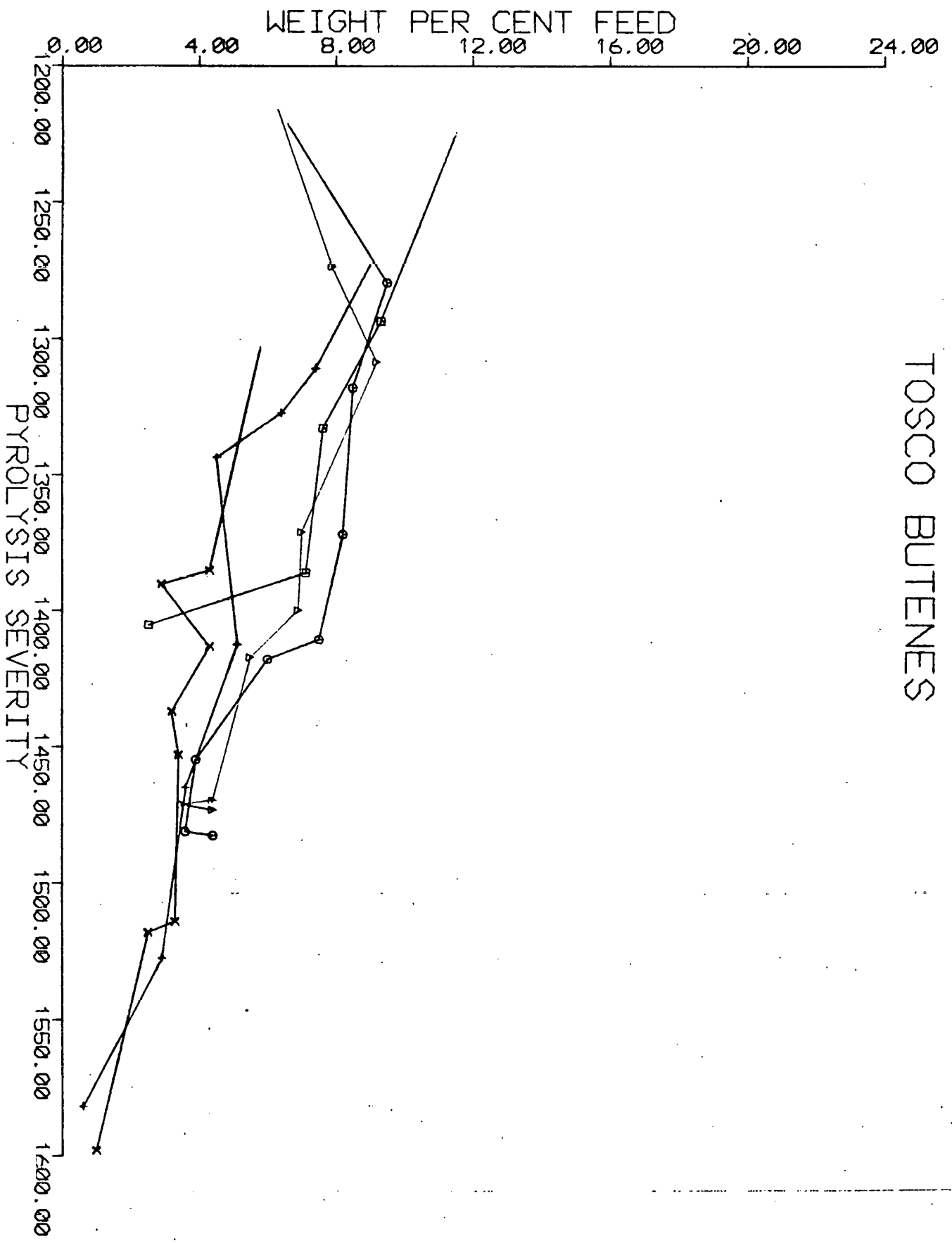
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TOSCO BUTENES

Figure 18

Task 4: Analysis and Measurements on Feedstocks and Products

Analyses of liquid products from the non-hydrogenated whole oils and vacuum distillates were completed during the previous quarter and reported in the last quarterly progress report.

Task 5: Data Correlation

During this quarter, the correlation effort was extended to encompass the hydrogenated samples of the vacuum distillates of both the Tosco II and simulated in-situ shale oils in a fashion similar to that presented in the last quarterly report (June 5, 1978). The effort was concentrated on finding the best exponent α in the equation:

$$S = T\theta^{\alpha}$$

where

S	is Severity factor
T	is Tempature, ^{o}F
θ	is residence time, sec.

Also, the use of internal measures of severity (Propylene/ethylene ratio) was investigated. Table 5 gives the results for the best individual and overall exponent α for the major components and samples. The best overall exponents for the hydrogenated feedstocks varied from .03 - .04. Due to sample gasification, the severely hydrogenated Tosco II oil pyrolysis results were not correlated. Considerable variation can be seen for individual components. The yield of propylene was correlated with an exponent of 0.06 and the results can be found in figures 19 to 23 and Table 6.

The yield data were plotted against the internal severity measure - Propylene to ethylene ratio - and found to correlate rather well as can be

seen from figures 24 to 28.

As was stated in the last quarterly report, the external severity function, S, can easily be related to the internal severity (propylene/ethylene ratio) by the combined use of figures 24 to 28 and figures 19 to 23 or Table 6.

TABLE 5

Summary of Results for Exponent α for Hydrogenated Samples

Component	Laramie			Tosco II	
	6201	6204	6202	6205	6206
C_2H_4	0.01	0.03	0.0	0.0	0.01
C_3H_6	0.07	0.01	0.06	0.04	0.07
C_4H_6	0.06	0.04	0.03	0.03	0.06
C_4H_8'S	0.07	0.02	0.04	0.05	0.07
CH_4	0.02	0.06	0.02	0.03	0.02
Overall	0.04	0.03	0.04	0.03	0.04

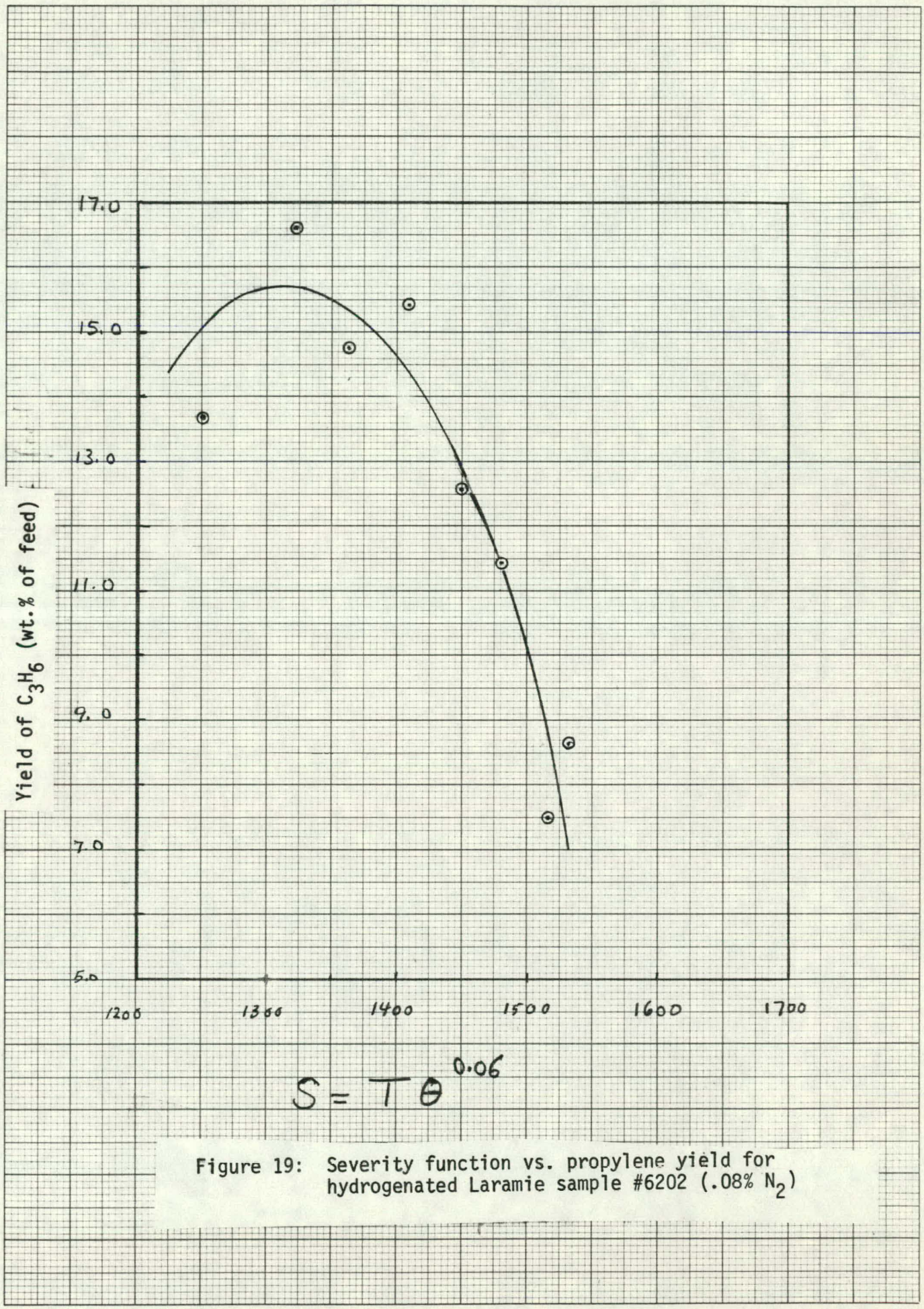


Figure 19: Severity function vs. propylene yield for hydrogenated Laramie sample #6202 (.08% N_2)

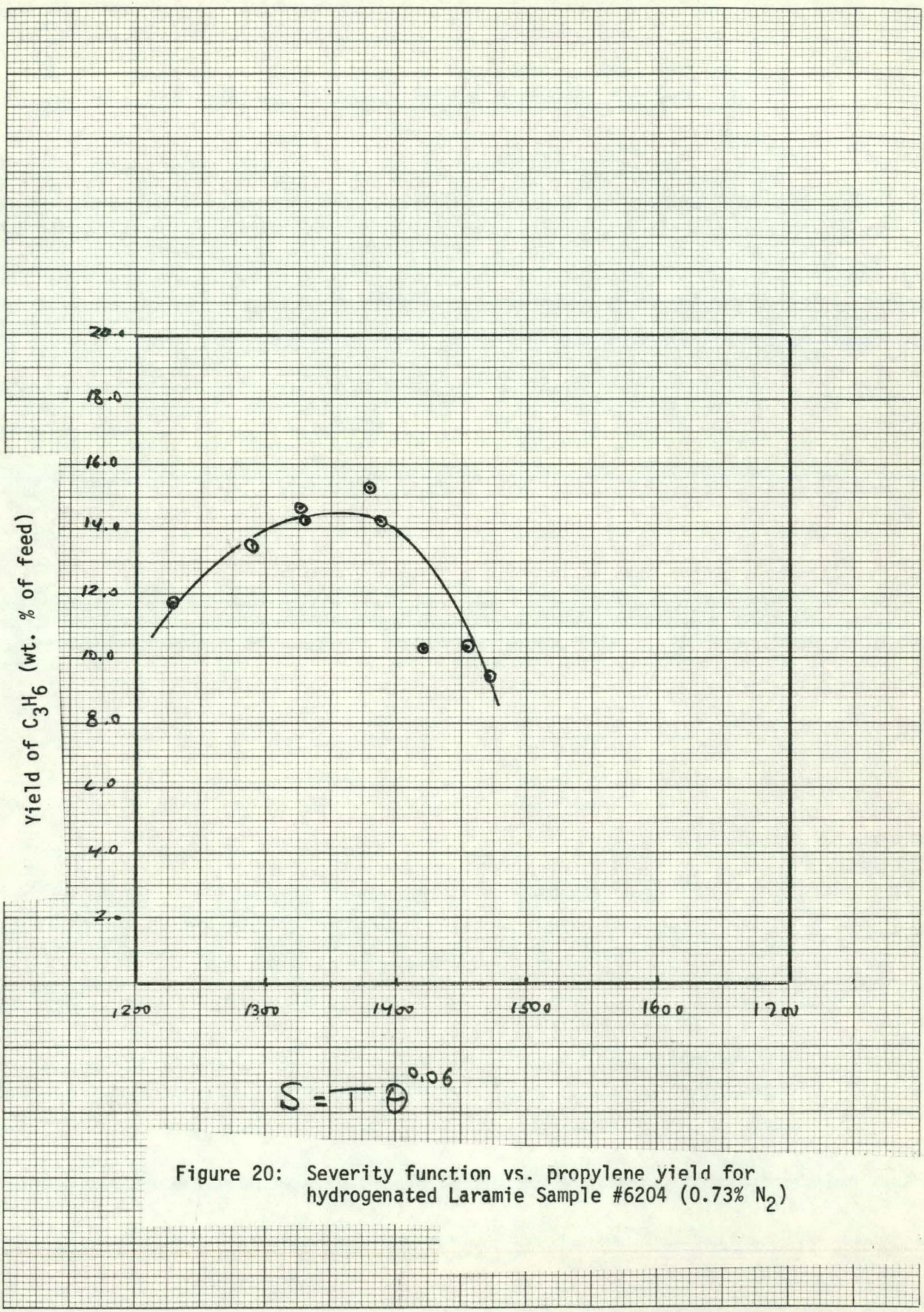


Figure 20: Severity function vs. propylene yield for hydrogenated Laramie Sample #6204 (0.73% N_2)

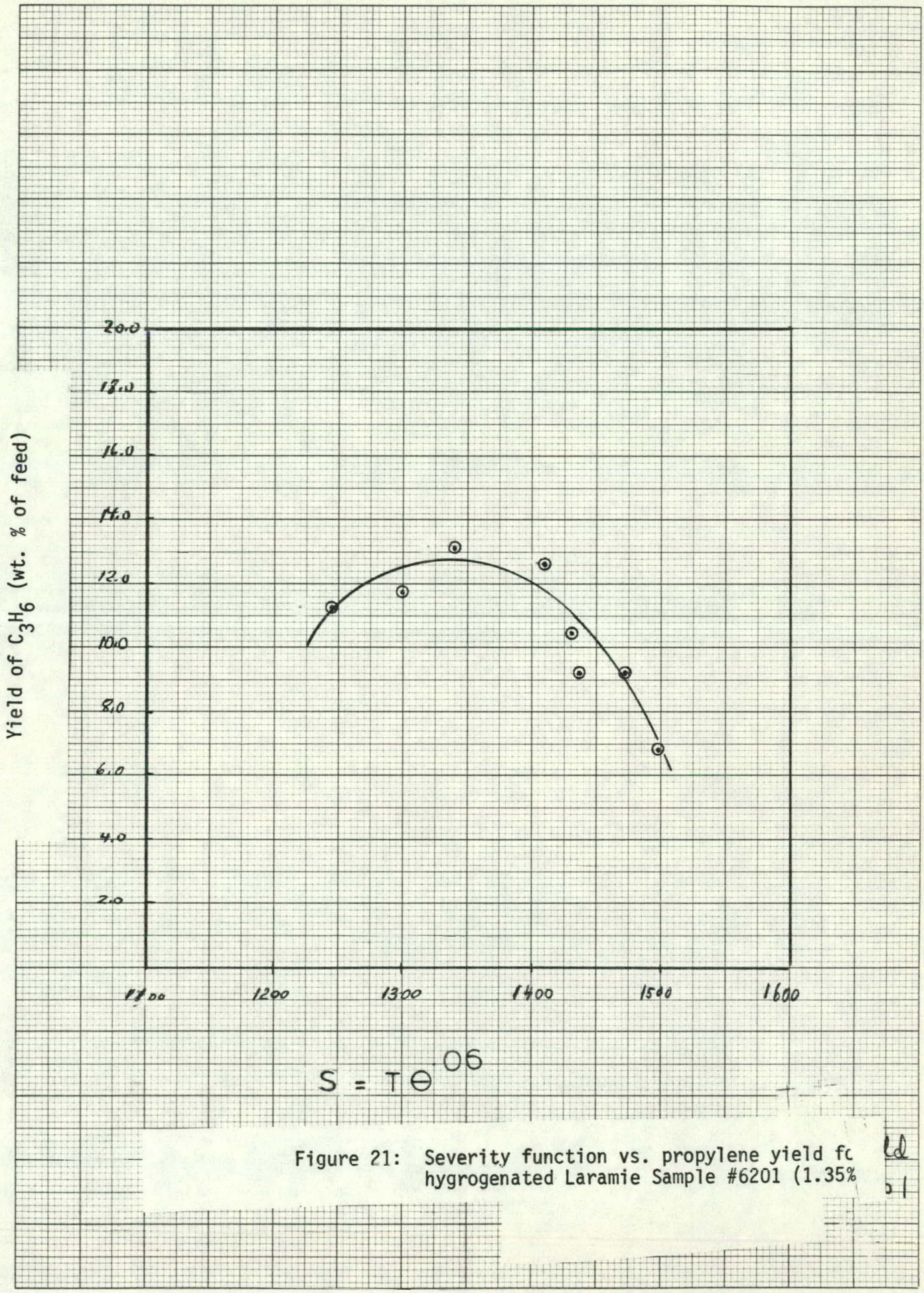


Figure 21: Severity function vs. propylene yield fc
hygrogenated Laramie Sample #6201 (1.35%

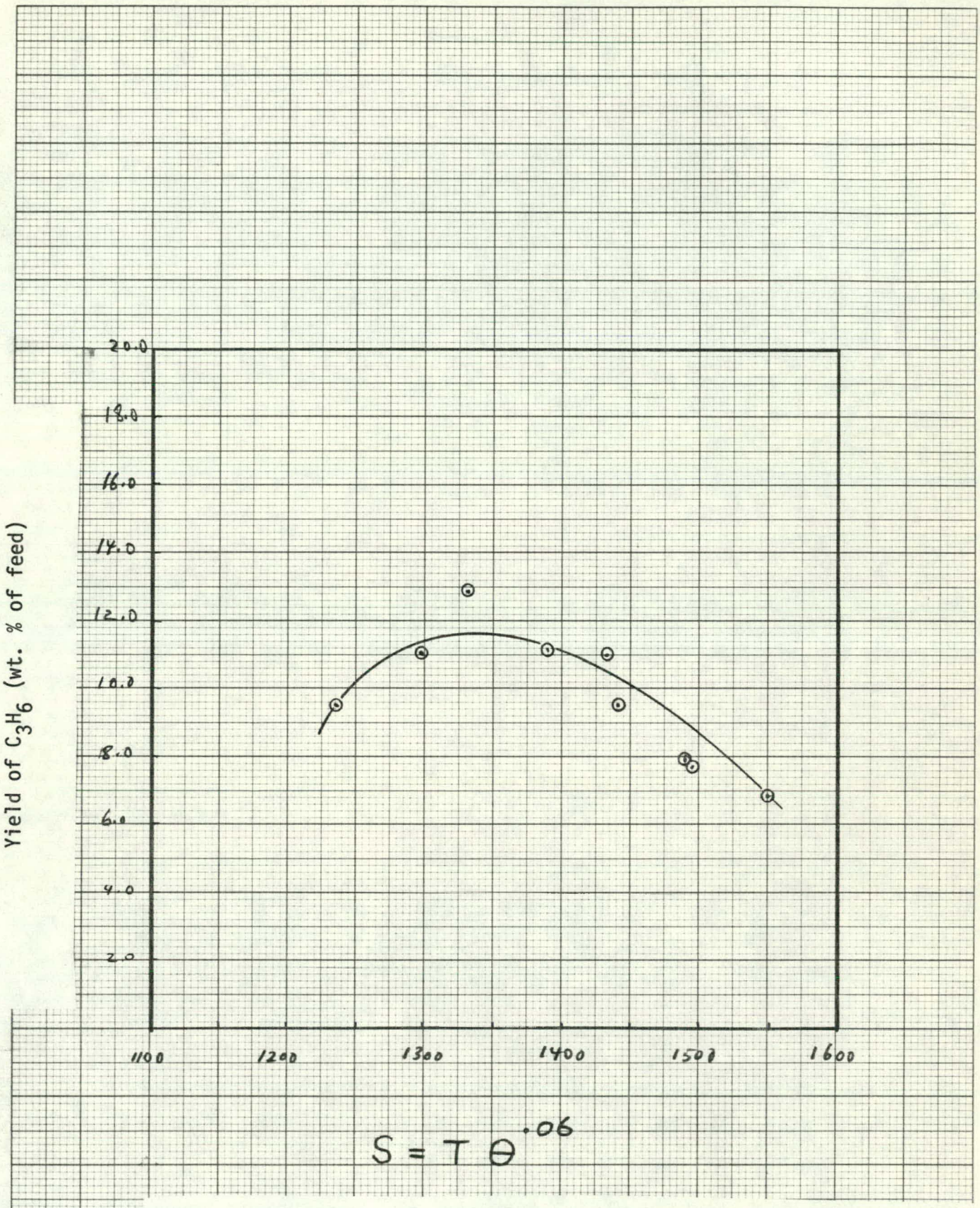


Figure 22: Severity function vs. propylene yield for hydrogenated Tosco II Sample # 6025 (1.55% N_2)

TABLE 6

Values of the Regression Coefficient for Propylene ($S = T\theta^{.06}$)

$$Y = Ao + A_1S + A_2S^2 + A_3S^3$$

Sample Feed	Ao	A_1	A_2	A_3	$*R^2$
6201 (NTU)	$- 2.106 \times 10^{2}$	2.387×10^{-1}	1.887×10^{-5}	$- 5.425 \times 10^{-8}$	0.84
6204 (NTU)	$- 2.001 \times 10^{3}$	4.044	$- 2.670 \times 10^{-3}$	5.781×10^{-7}	0.83
6202 (NTU)	$- 1.848 \times 10^{3}$	3.767	$- 2.505 \times 10^{-3}$	5.459×10^{-7}	0.93
6205 (Tosco)	$- 1.937 \times 10^{3}$	4.062	$- 2.802 \times 10^{-3}$	6.383×10^{-7}	0.91
6206 (Tosco)	$- 1.934 \times 10^{3}$	4.004	$- 2.723 \times 10^{-3}$	6.111×10^{-7}	

* R^2 = Coefficient of regression

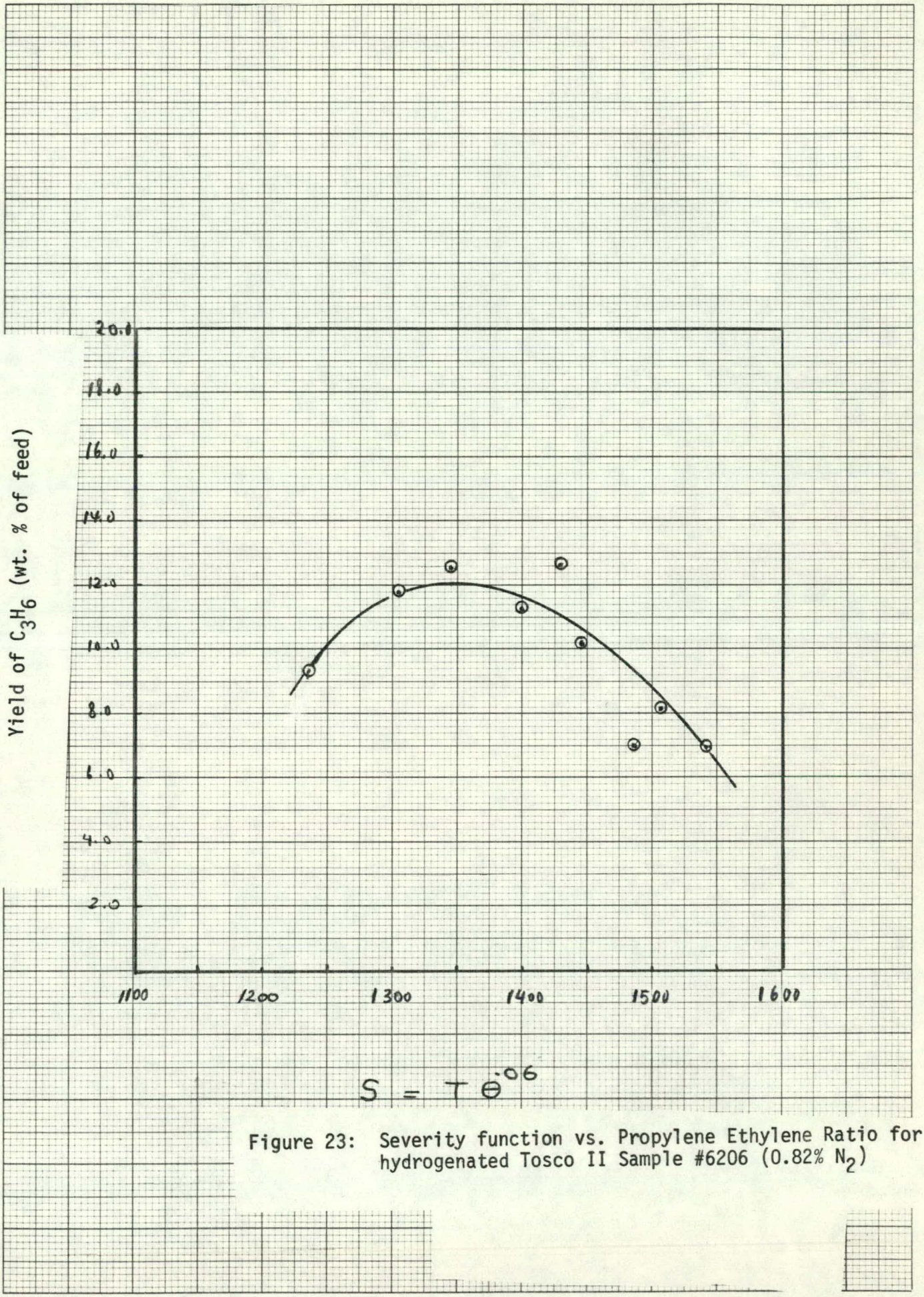


Figure 23: Severity function vs. Propylene Ethylene Ratio for hydrogenated Tosco II Sample #6206 (0.82% N_2)

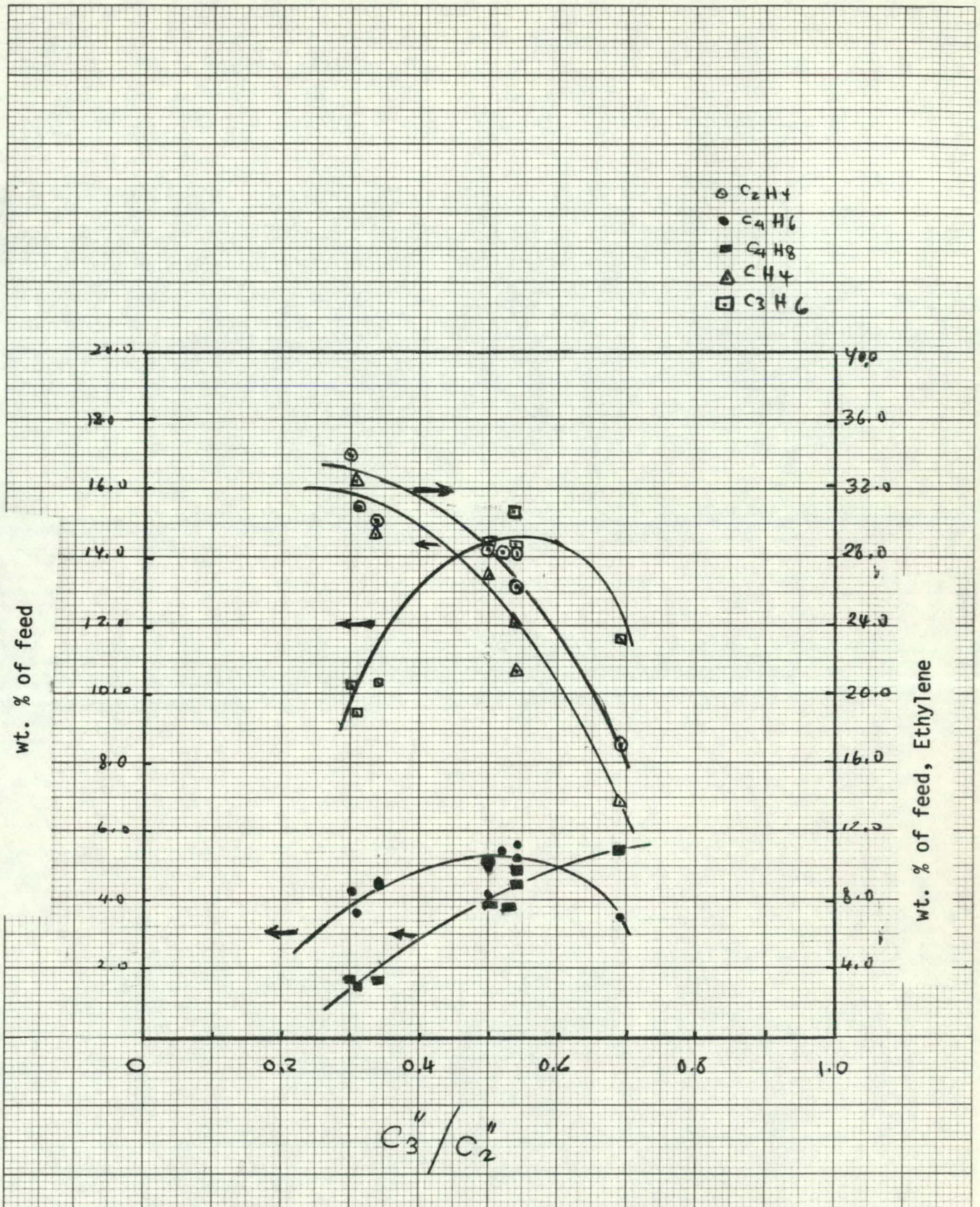


Figure 25: Yield vs. Propylene/Ethylene ratio for hydrogenated Laramie Sample #6204 (0.73% N_2)

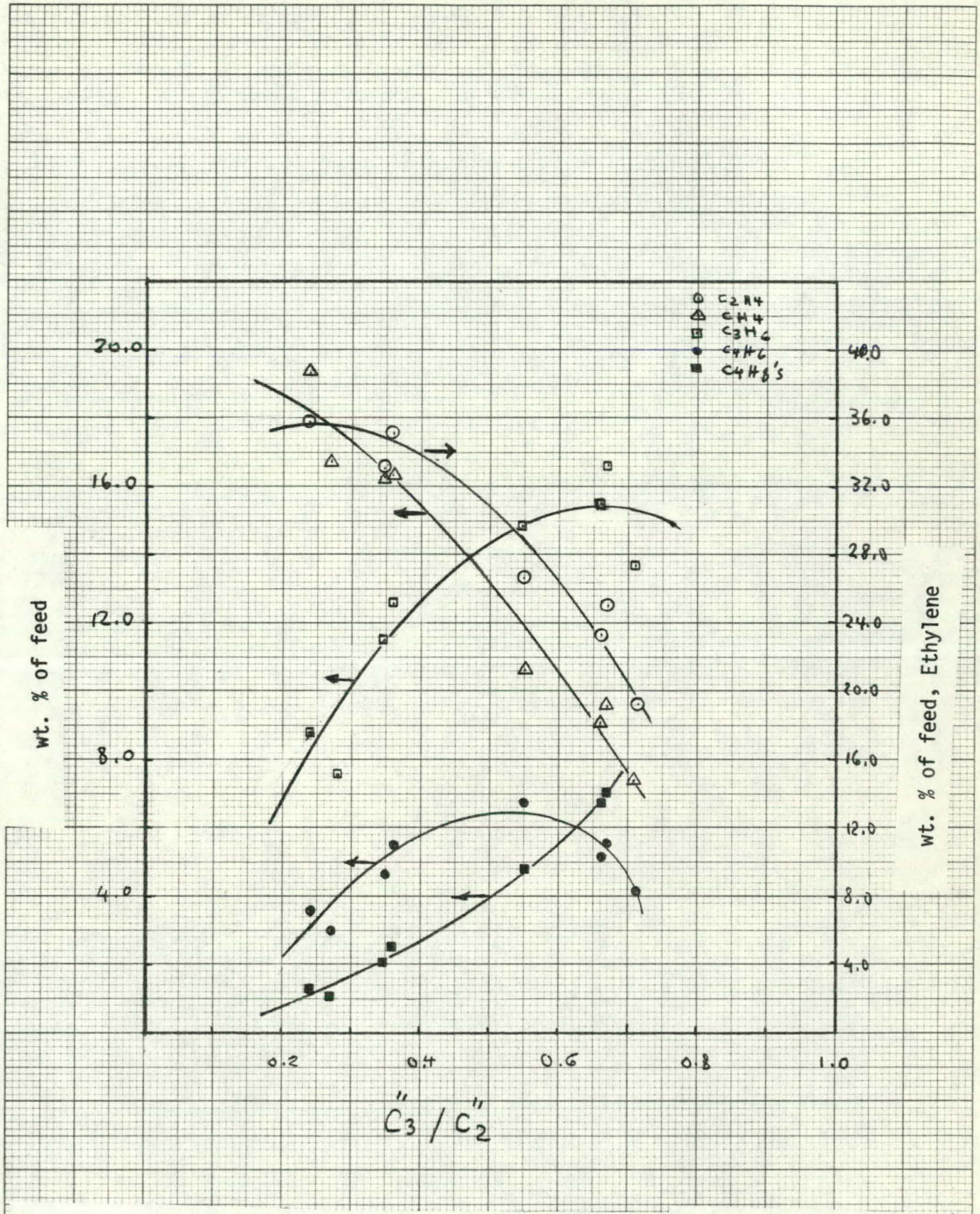


Figure 24: Yield vs. Propylene/Ethylene ratio for hydrogenated Laramie Sample #6202 (.08% N_2)

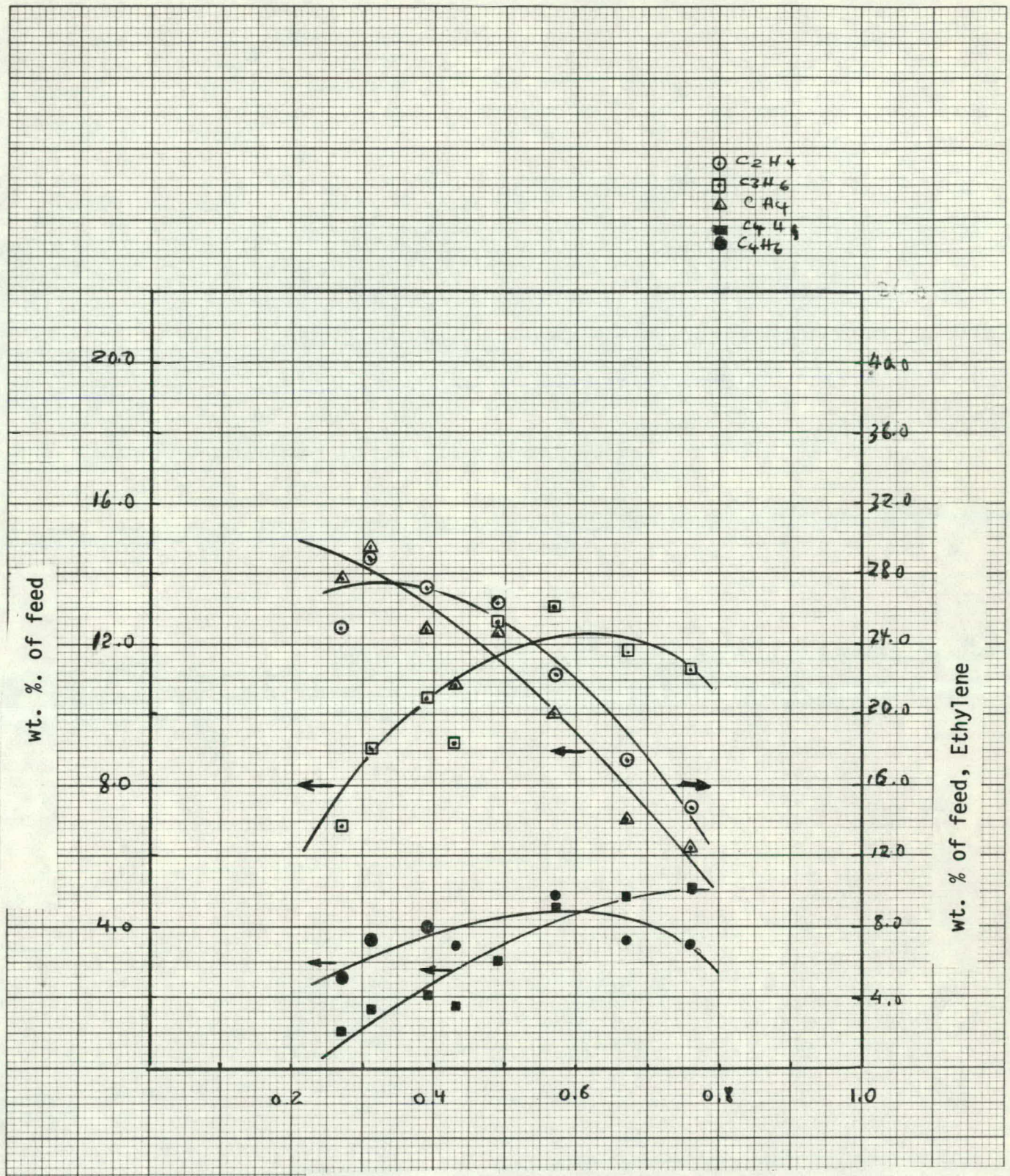


Figure 26: Yield vs. Propylene/Ethylene ratio for hydrogenated Laramie Sample #6201 (1.35% N_2)

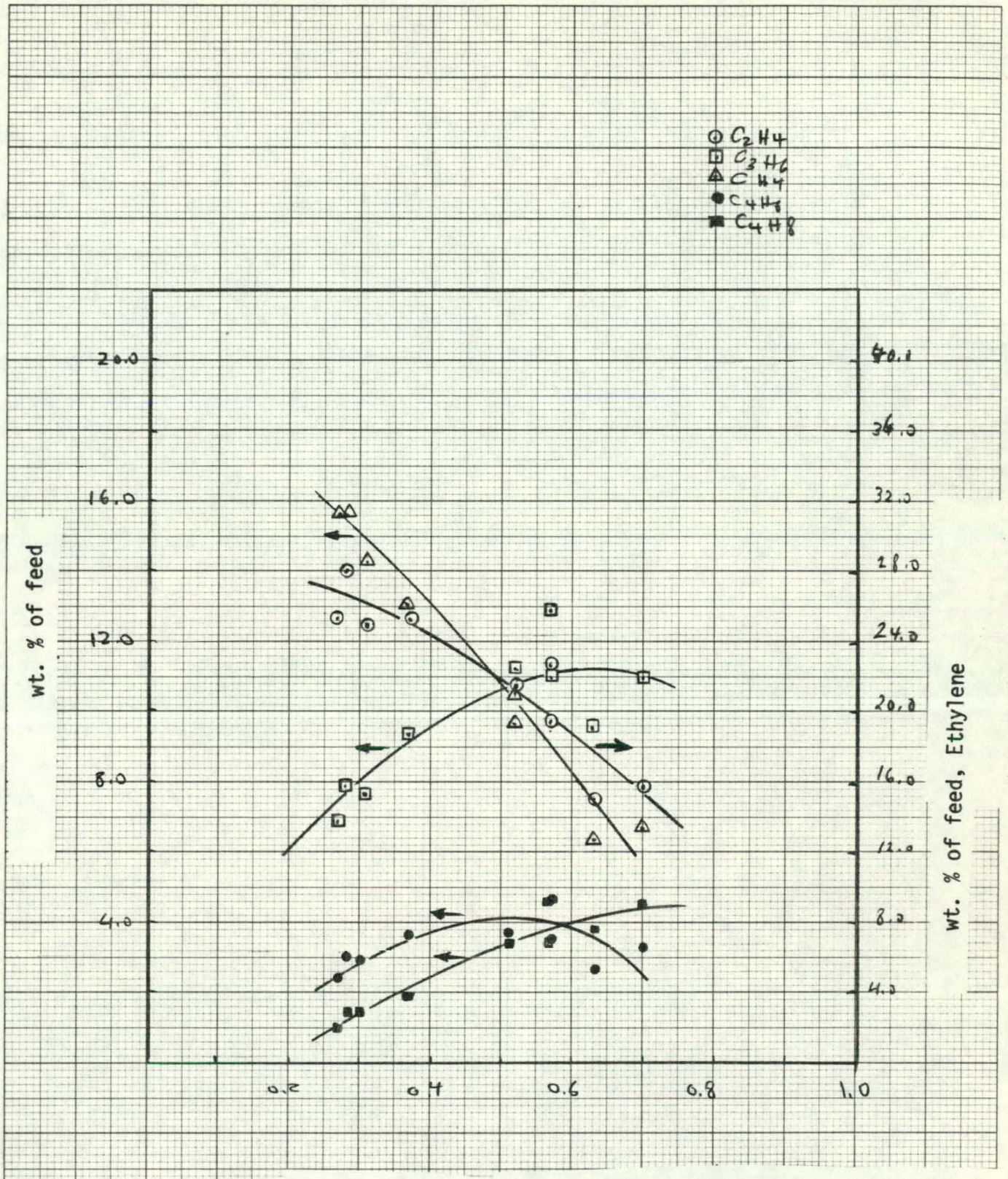


Figure 27: Yield vs. Propylene/Ethylene ratio for hydrogenated Tosco II Sample #6205 (1.55% N_2)

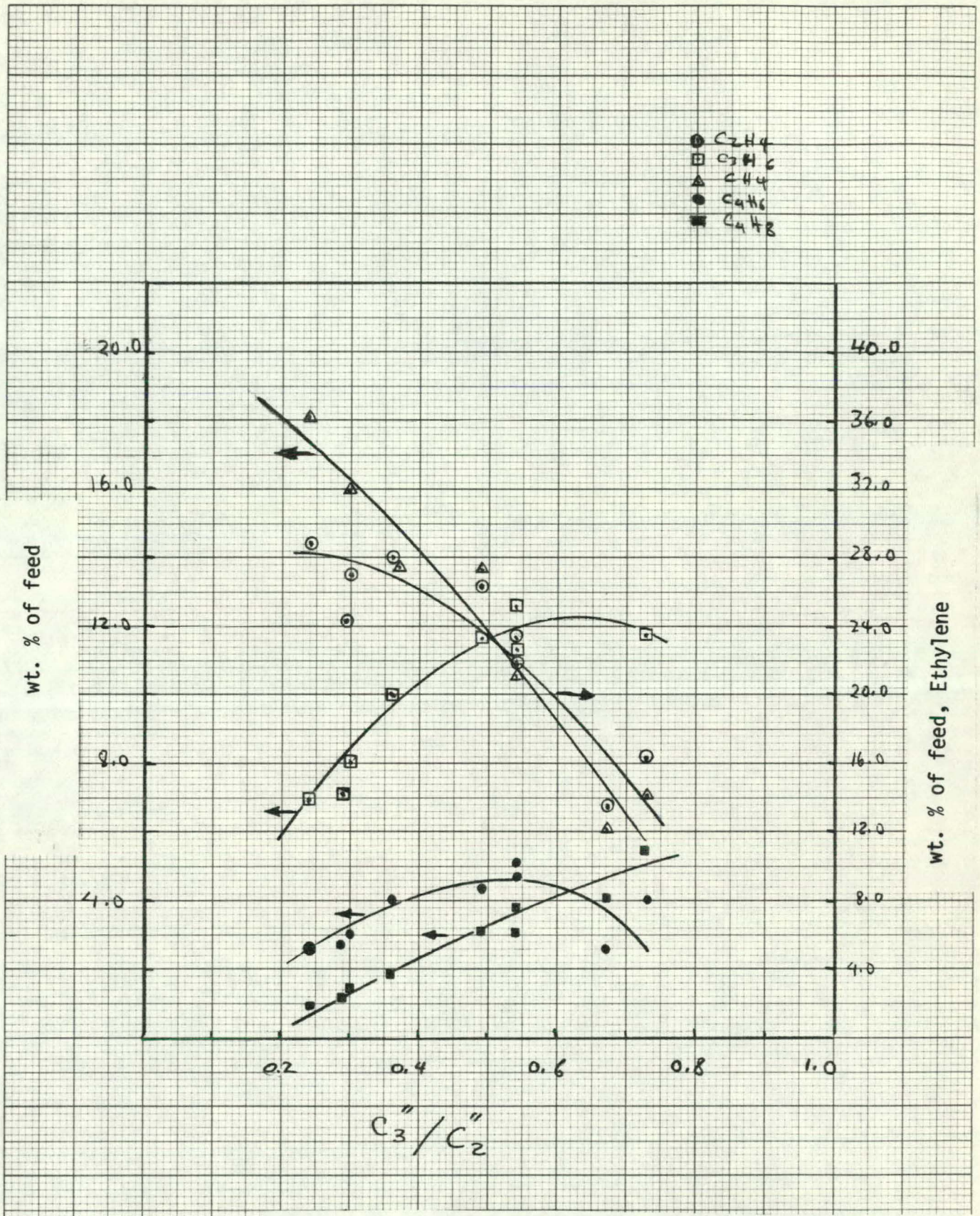


Figure 28: Yield vs. Propylene/Ethylene ratio for hydrogenated Tosco II Sample # 6206 (0.82% N_2)

Task 7:

Feedstocks, liquid products, and water samples have been retained for each of the experimental runs. Samples of each of the feed samples have been shipped to the Laramie Energy Research Center.

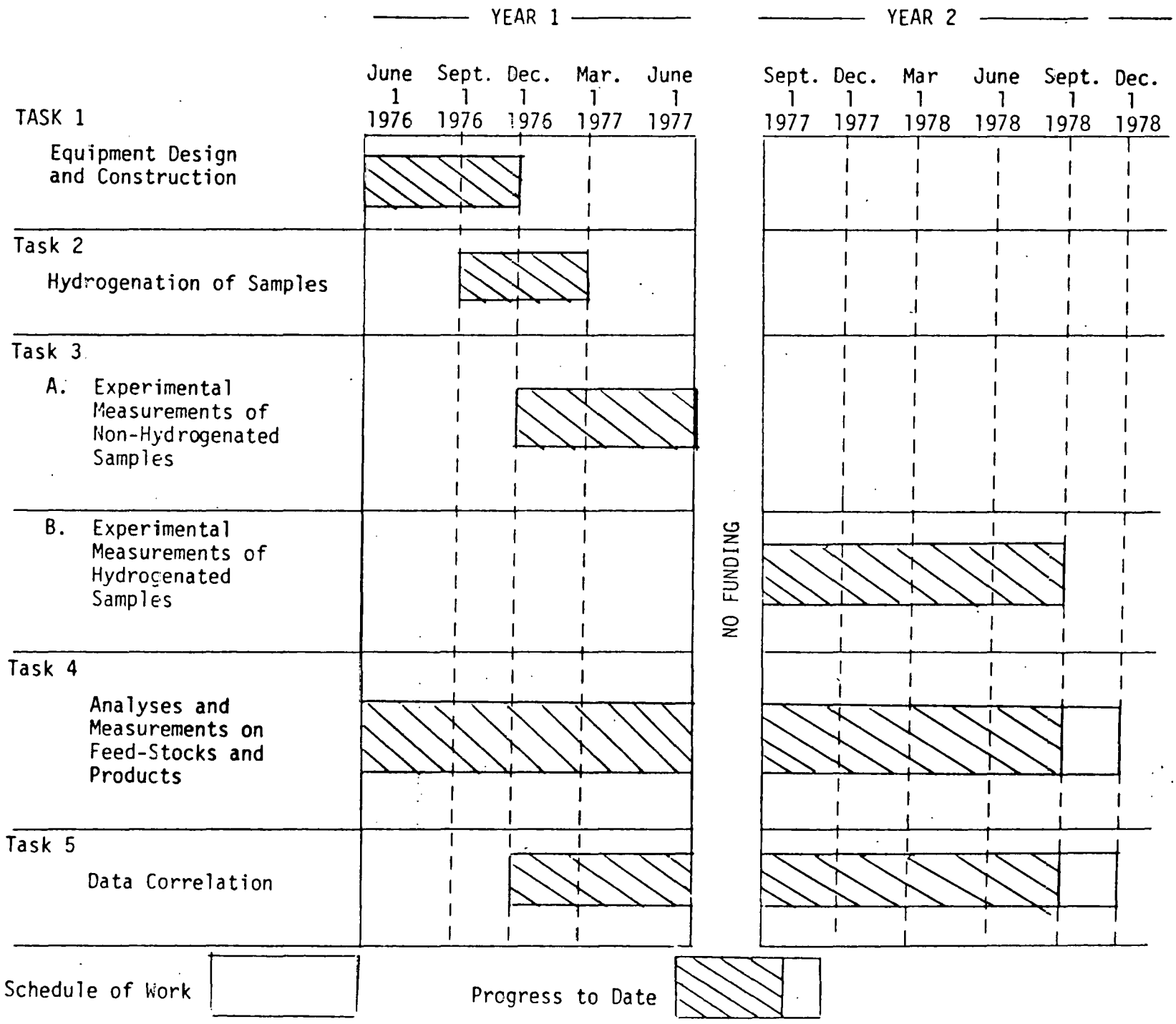
Projections for Next Quarter, September 1978 - November 1978

All experimental runs originally outlined as a part of the contract have been completed. During the next, quarter, additional experimental runs will be obtained with the Tosco II and simulated in-situ whole oil at short residence times in order to determine kinetic parameters for our required correlation effort. Further, experimental runs will be obtained with a Paraho severly hydrogenated oil in order to better understand the undesirable gasification reactions. Work will continue on our correlation efforts.

Conclusions

The experimental program originally outlined as a part of the contract has been completed. Additional experimental runs are being performed in order to define kinetic model parameters required for our correlation work and to investigate the unexpected gasification reactions which occur at high severity for low nitrogen oil samples.

GRAPH OF PROGRESS TO DATE



APPENDIX

DETAILED RESULTS

RUN NUMBER =M051878027

	MAX T ISO	MAX T NONISO	AVE T ISO	AVE T NONISO
REACTION TEMPERATURE (DEG F)	1556.0	1556.0	1496.9	1496.9
REACTION TIME (SEC)	0.392	0.232	0.404	0.447
STEAM-OIL MASS RATIO	0.744	0.744	0.744	0.744
PYROLYSIS SEVERITY FACTOR	1449.5	1404.5	1396.9	1405.3

GASEOUS PRODUCTS
WT % OF FEED 62.14
SCF/LB OF FEED 9.94

COMPONENT	MOL %GAS	WT % GAS	WT % FEED	SCF/# FEED
HYDROGEN	12.64	1.07	0.67	1.26
CARBON MONOXIDE	2.71	3.19	1.98	0.27
METHANE	30.62	20.69	12.86	3.04
PROPANE	0.25	0.46	0.29	0.02
PROPYLENE	9.49	16.83	10.46	0.94
N-BUTANE	0.21	0.53	0.33	0.02
HYDROGEN SULFIDE	0.00	0.00	0.00	0.00
1-BUTENE	0.84	1.99	1.24	0.08
ISOBUTYLENE	0.00	0.00	0.00	0.00
TRANS-2-BUTENE	0.48	1.15	0.71	0.05
CIS-2-BUTENE	0.06	0.15	0.09	0.01
1-3 BUTADIENE	2.89	6.59	4.09	0.29
CARBON DIOXIDE	0.11	0.21	0.13	0.01
ETHYLENE	36.95	43.67	27.14	3.67
ETHANE	2.74	3.47	2.16	0.27
ISOBUTANE	0.00	0.00	0.00	0.00

LIQUID PRODUCTS
WT % OF FEED 37.86

SOLID PRODUCTS
WT% OF FEED 0.00

RUN NUMBER =H051978028

	MAX T ISO	MAX T NONISO	AVE T ISO	AVE T NONISO
REACTION TEMPERATURE (DEG F)	1447.0	1447.0	1406.6	1406.6
REACTION TIME (SEC)	0.401	0.265	0.409	0.434
STEAM-OIL MASS RATIO	0.706	0.706	0.706	0.706
PYROLYSIS SEVERITY FACTOR	1346.0	1313.0	1310.1	1314.8

GASEOUS PRODUCTS
WT % OF FEED 60.32
SCF/LB OF FEED 8.59

COMPONENT	MOL %GAS	WT % GAS	WT % FEED	SCF/# FEED
HYDROGEN	8.34	0.63	0.38	0.72
CARBON MONOXIDE	2.45	2.57	1.55	0.21
METHANE	27.62	16.61	10.02	2.37
PROPANE	0.52	0.85	0.52	0.04
PROPYLENE	13.76	21.70	13.09	1.18
N-BUTANE	0.16	0.36	0.21	0.01
HYDROGEN SULFIDE	0.00	0.00	0.00	0.00
1-BUTENE	2.88	6.05	3.65	0.25
ISOBUTYLENE	0.00	0.00	0.00	0.00
TRANS-2-BUTENE	0.50	1.06	0.64	0.04
CIS-2-BUTENE	0.20	0.42	0.25	0.02
1-3 BUTADIENE	3.69	7.48	4.51	0.32
CARBON DIOXIDE	0.10	0.17	0.10	0.01
ETHYLENE	36.15	38.01	22.93	3.10
ETHANE	3.64	4.10	2.47	0.31
ISOBUTANE	0.00	0.00	0.00	0.00

LIQUID PRODUCTS
WT % OF FEED 39.68

SOLID PRODUCTS
WT% OF FEED 0.00

RUN NUMBER =H052278029

	MAX T ISO	MAX T NONISO	AVE T ISO	AVE T NONISO
REACTION TEMPERATURE (DEG F)	1348.0	1348.0	1307.6	1307.6
REACTION TIME (SEC)	0.392	0.251	0.401	0.435
STEAM-OIL MASS RATIO	0.759	0.759	0.759	0.759
PYROLYSIS SEVERITY FACTOR	1257.0	1223.8	1220.9	1226.9

GASEOUS PRODUCTS

WT % OF FEED 45.47

SCF/LB OF FEED 6.18

COMPONENT	MOL %GAS	WT % GAS	WT % FEED	SCF/# FEED
HYDROGEN	9.01	0.65	0.30	0.56
CARBON MONOXIDE	2.51	2.52	1.15	0.16
METHANE	24.36	13.99	6.36	1.51
PROPANE	0.64	1.01	0.46	0.04
PROPYLENE	16.48	24.84	11.29	1.02
N-BUTANE	0.16	0.33	0.15	0.01
HYDROGEN SULFIDE	0.00	0.00	0.00	0.00
1-BUTENE	4.68	9.40	4.27	0.29
ISOBUTYLENE	0.00	0.00	0.00	0.00
TRANS-2-BUTENE	0.57	1.15	0.52	0.04
CIS-2-BUTENE	0.34	0.69	0.31	0.02
1-3 BUTADIENE	3.89	7.53	3.43	0.24
CARBON DIOXIDE	0.07	0.12	0.05	0.00
ETHYLENE	32.57	32.71	14.87	2.01
ETHANE	4.71	5.07	2.31	0.29
ISOBUTANE	0.00	0.00	0.00	0.00

LIQUID PRODUCTS

WT % OF FEED 54.53

SOLID PRODUCTS

WT% OF FEED 0.00

RUN NUMBER =H052678030

	MAX T ISO	MAX T NONISO	AVE T ISO	AVE T NONISO
REACTION TEMPERATURE (DEG F)	1490.0	1490.0	1411.7	1411.7
REACTION TIME (SEC)	0.765	0.379	0.797	0.964
STEAM-OIL MASS RATIO	0.739	0.739	0.739	0.739
PYROLYSIS SEVERITY FACTOR	1444.2	1384.5	1371.7	1387.5

GASEOUS PRODUCTS
WT % OF FEED 64.35
SCF/LB OF FEED10.34

COMPONENT	MOL %GAS	WT % GAS	WT % FEED	SCF/# FEED
HYDROGEN	14.10	1.20	0.77	1.46
CARBON MONOXIDE	4.23	5.07	3.26	0.44
METHANE	28.88	19.60	12.61	2.99
PROPANE	0.32	0.59	0.38	0.03
PROPYLENE	11.07	19.71	12.68	1.14
N-BUTANE	0.17	0.42	0.27	0.02
HYDROGEN SULFIDE	0.03	0.04	0.03	0.00
1-BUTENE	1.48	3.50	2.25	0.15
ISOBUTYLENE	0.00	0.00	0.00	0.00
TRANS-2-BUTENE	0.40	0.94	0.61	0.04
CIS-2-BUTENE	0.11	0.26	0.17	0.01
1-3 BUTADIENE	1.56	3.57	2.30	0.16
CARBON DIOXIDE	0.20	0.38	0.25	0.02
ETHYLENE	34.22	40.62	26.14	3.54
ETHANE	3.20	4.07	2.62	0.33
ISOBUTANE	0.00	0.00	0.00	0.00

LIQUID PRODUCTS
WT % OF FEED 35.65

SOLID PRODUCTS
WT% OF FEED 0.00

RUN NUMBER =H053078031

	MAX T ISO	MAX T NONISO	AVE T ISO	AVE T NONISO
REACTION TEMPERATURE (DEG F)	1597.0	1597.0	1506.6	1506.6
REACTION TIME (SEC)	0.696	0.339	0.728	0.900
STEAM-OIL MASS RATIO	0.840	0.840	0.840	0.840
PYROLYSIS SEVERITY FACTOR	1549.0	1483.6	1465.3	1484.0

GASEOUS PRODUCTS
WT % OF FEED 58.32
SCF/LB OF FEED10.45

COMPONENT	MOL %GAS	WT % GAS	WT % FEED	SCF/# FEED
HYDROGEN	17.93	1.71	0.99	1.87
CARBON MONOXIDE	7.34	9.70	5.66	0.77
METHANE	31.45	23.81	13.88	3.29
PROPANE	0.12	0.25	0.15	0.01
PROPYLENE	5.92	11.75	6.85	0.62
N-BUTANE	0.12	0.32	0.18	0.01
HYDROGEN SULFIDE	0.00	0.00	0.00	0.00
1-BUTENE	0.30	0.79	0.46	0.03
ISOBUTYLENE	0.00	0.00	0.00	0.00
TRANS-2-BUTENE	0.33	0.88	0.51	0.03
CIS-2-BUTENE	0.04	0.09	0.05	0.00
1-3 BUTADIENE	1.70	4.35	2.53	0.18
CARBON DIOXIDE	0.17	0.38	0.22	0.02
ETHYLENE	32.43	42.92	25.03	3.39
ETHANE	2.16	3.06	1.79	0.23
ISOBUTANE	0.00	0.00	0.00	0.00

LIQUID PRODUCTS
WT % OF FEED 41.68

SOLID PRODUCTS
WT% OF FEED 0.00

RUN NUMBER =M060178032

	MAX T ISO	MAX T NONISO	AVE T ISO	AVE T NONISO
REACTION TEMPERATURE (DEG F)	1377.0	1377.0	1304.6	1304.6
REACTION TIME (SEC)	0.722	0.347	0.752	0.917
STEAM-OIL MASS RATIO	1.149	1.149	1.149	1.149
PYROLYSIS SEVERITY FACTOR	1359.8	1301.3	1291.4	1306.9

GASEOUS PRODUCTS
WT % OF FEED 52.78
SCF/LB OF FEED 7.65

COMPONENT	MOL %GAS	WT % GAS	WT % FEED	SCF/# FEED
HYDROGEN	13.17	1.01	0.54	1.01
CARBON MONOXIDE	8.65	9.25	4.88	0.66
METHANE	21.87	13.40	7.07	1.67
PROPANE	0.43	0.72	0.38	0.03
PROPYLENE	13.83	22.22	11.73	1.06
N-BUTANE	0.15	0.33	0.18	0.01
HYDROGEN SULFIDE	0.03	0.04	0.02	0.00
1-BUTENE	3.59	7.69	4.06	0.27
ISOBUTYLENE	0.00	0.00	0.00	0.00
TRANS-2-BUTENE	0.50	1.07	0.57	0.04
CIS-2-BUTENE	0.22	0.47	0.25	0.02
1-3 BUTADIENE	3.25	6.72	3.55	0.25
CARBON DIOXIDE	0.11	0.19	0.10	0.01
ETHYLENE	30.96	33.16	17.50	2.37
ETHANE	3.23	3.71	1.96	0.25
ISOBUTANE	0.00	0.00	0.00	0.00

LIQUID PRODUCTS
WT % OF FEED 47.22

SOLID PRODUCTS
WT% OF FEED 0.00

RUN NUMBER =H060278033

	MAX T ISO	MAX T NONISO	AVE T ISO	AVE T NONISO
REACTION TEMPERATURE (DEG F)	1487.0	1487.0	1409.0	1409.0
REACTION TIME (SEC)	1.085	0.527	1.130	1.340
STEAM-OIL MASS RATIO	0.934	0.934	0.934	0.934
PYROLYSIS SEVERITY FACTOR	1489.2	1426.0	1414.5	1429.1

GASEOUS PRODUCTS
WT % OF FEED 55.72
SCF/LB OF FEED 9.45

COMPONENT	MOL %GAS	WT % GAS	WT % FEED	SCF/# FEED
HYDROGEN	18.38	1.65	0.92	1.74
CARBON MONOXIDE	8.00	10.00	5.57	0.76
METHANE	27.42	19.64	10.94	2.59
PROPANE	0.24	0.47	0.26	0.02
PROPYLENE	8.70	16.34	9.11	0.82
N-BUTANE	0.13	0.34	0.19	0.01
HYDROGEN SULFIDE	0.02	0.03	0.02	0.00
1-BUTENE	0.85	2.17	1.21	0.08
ISOBUTYLENE	0.00	0.00	0.00	0.00
TRANS-2-BUTENE	0.36	0.89	0.50	0.03
CIS-2-BUTENE	0.09	0.23	0.13	0.01
1-3 BUTADIENE	2.52	6.09	3.40	0.24
CARBON DIOXIDE	0.33	0.61	0.34	0.03
ETHYLENE	30.34	38.00	21.17	2.87
ETHANE	2.64	3.54	1.97	0.25
ISOBUTANE	0.00	0.00	0.00	0.00

LIQUID PRODUCTS
WT % OF FEED 44.28

SOLID PRODUCTS
WT% OF FEED 0.00

RUN NUMBER =H060578034

	MAX T ISO	MAX T NONISO	AVE T ISO	AVE T NONISO
REACTION TEMPERATURE (DEG F)	1609.0	1609.0	1545.7	1545.7
REACTION TIME (SEC)	0.388	0.233	0.400	0.454
STEAM-OIL MASS RATIO	0.859	0.859	0.859	0.859
PYROLYSIS SEVERITY FACTOR	1508.5	1463.2	1451.9	1463.0

GASEOUS PRODUCTS
WT % OF FEED 65.49
SCF/LB OF FEED11.06

COMPONENT	MOL %GAS	WT % GAS	WT % FEED	SCF/# FEED
HYDROGEN	14.86	1.33	0.87	1.64
CARBON MONOXIDE	3.82	4.75	3.12	0.42
METHANE	31.68	22.61	14.81	3.51
PROPANE	0.16	0.31	0.20	0.02
PROPYLENE	7.46	13.97	9.15	0.83
N-BUTANE	0.21	0.55	0.36	0.02
HYDROGEN SULFIDE	0.00	0.00	0.00	0.00
1-BUTENE	0.54	1.36	0.89	0.06
ISOBUTYLENE	0.00	0.00	0.00	0.00
TRANS-2-BUTENE	0.46	1.14	0.75	0.05
CIS-2-BUTENE	0.05	0.13	0.09	0.01
1-3 BUTADIENE	2.33	5.61	3.67	0.26
CARBON DIOXIDE	0.11	0.23	0.15	0.01
ETHYLENE	36.15	45.11	29.54	4.00
ETHANE	2.16	2.88	1.89	0.24
ISOBUTANE	0.00	0.00	0.00	0.00

LIQUID PRODUCTS
WT % OF FEED 34.51

SOLID PRODUCTS
WT% OF FEED 0.00

RUN NUMBER =H060778035

	MAX T ISO	MAX T NONISO	AVE T ISO	AVE T NONISO
REACTION TEMPERATURE (DEG F)	1463.0	1463.0	1407.0	1407.0
REACTION TIME (SEC)	0.419	0.247	0.431	0.486
STEAM-OIL MASS RATIO	0.665	0.665	0.665	0.665
PYROLYSIS SEVERITY FACTOR	1360.5	1317.9	1310.7	1320.2

GASEOUS PRODUCTS
WT % OF FEED 61.70
SCF/LB OF FEED 9.36

COMPONENT	MOL %GAS	WT % GAS	WT % FEED	SCF/# FEED
HYDROGEN	12.96	1.04	0.64	1.21
CARBON MONOXIDE	3.99	4.47	2.76	0.37
METHANE	26.92	17.25	10.64	2.52
PROPANE	0.40	0.71	0.44	0.04
PROPYLENE	12.13	20.38	12.58	1.13
N-BUTANE	0.19	0.44	0.27	0.02
HYDROGEN SULFIDE	0.00	0.00	0.00	0.00
1-BUTENE	2.13	4.78	2.95	0.20
ISOBUTYLENE	0.00	0.00	0.00	0.00
TRANS-2-BUTENE	0.48	1.08	0.66	0.04
CIS-2-BUTENE	0.18	0.40	0.24	0.02
1-3 BUTADIENE	3.52	7.60	4.69	0.33
CARBON DIOXIDE	0.04	0.07	0.04	0.00
ETHYLENE	33.77	37.83	23.35	3.16
ETHANE	3.29	3.95	2.44	0.31
ISOBUTANE	0.00	0.00	0.00	0.00

LIQUID PRODUCTS
WT % OF FEED 38.30

SOLID PRODUCTS
WT% OF FEED 0.00

RUN NUMBER =H060778036

	MAX T ISO	MAX T NONISO	AVE T ISO	AVE T NONISO
REACTION TEMPERATURE (DEG F)	1576.0	1576.0	1508.1	1508.1
REACTION TIME (SEC)	0.409	0.235	0.423	0.492
STEAM-OIL MASS RATIO	0.686	0.686	0.686	0.686
PYROLYSIS SEVERITY FACTOR	1465.8	1417.8	1405.6	1418.3

GASEOUS PRODUCTS
WT % OF FEED 64.32
SCF/LB OF FEED10.75

COMPONENT	MOL %GAS	WT % GAS	WT % FEED	SCF/# FEED
HYDROGEN	15.68	1.39	0.89	1.69
CARBON MONOXIDE	3.48	4.28	2.76	0.37
METHANE	30.20	21.32	13.71	3.25
PROPANE	0.21	0.42	0.27	0.02
PROPYLENE	8.50	15.75	10.13	0.91
N-BUTANE	0.18	0.47	0.30	0.02
HYDROGEN SULFIDE	0.00	0.00	0.00	0.00
1-BUTENE	0.69	1.71	1.10	0.07
ISOBUTYLENE	0.00	0.00	0.00	0.00
TRANS-2-BUTENE	0.45	1.12	0.72	0.05
CIS-2-BUTENE	0.07	0.16	0.11	0.01
1-3 BUTADIENE	2.66	6.33	4.07	0.29
CARBON DIOXIDE	0.09	0.18	0.12	0.01
ETHYLENE	35.35	43.66	28.08	3.80
ETHANE	2.43	3.21	2.07	0.26
ISOBUTANE	0.00	0.00	0.00	0.00

LIQUID PRODUCTS
WT % OF FEED 35.68

SOLID PRODUCTS
WT% OF FEED 0.00

RUN NUMBER =H060978037

	MAX T ISO	MAX T NONISO	AVE T ISO	AVE T NONISO
REACTION TEMPERATURE (DEG F)	1336.0	1336.0	1300.6	1300.6
REACTION TIME (SEC)	0.388	0.261	0.396	0.425
STEAM-OIL MASS RATIO	0.828	0.828	0.828	0.828
PYROLYSIS SEVERITY FACTOR	1250.4	1221.1	1218.7	1224.0

GASEOUS PRODUCTS
WT % OF FEED 41.14
SCF/LB OF FEED 5.95

COMPONENT	MOL %GAS	WT % GAS	WT % FEED	SCF/# FEED
HYDROGEN	12.33	0.95	0.39	0.73
CARBON MONOXIDE	6.23	6.65	2.73	0.37
METHANE	23.83	14.57	6.00	1.42
PROPANE	0.50	0.85	0.35	0.03
PROPYLENE	14.02	22.49	9.25	0.83
N-BUTANE	0.16	0.35	0.14	0.01
HYDROGEN SULFIDE	0.04	0.06	0.02	0.00
1-BUTENE	3.83	8.19	3.37	0.23
ISOBUTYLENE	0.00	0.00	0.00	0.00
TRANS-2-BUTENE	0.55	1.17	0.48	0.03
CIS-2-BUTENE	0.23	0.50	0.21	0.01
1-3 BUTADIENE	2.98	6.14	2.53	0.18
CARBON DIOXIDE	0.06	0.11	0.04	0.00
ETHYLENE	31.27	33.44	13.76	1.86
ETHANE	3.96	4.56	1.87	0.24
ISOBUTANE	0.00	0.00	0.00	0.00

LIQUID PRODUCTS
WT % OF FEED 58.86

SOLID PRODUCTS
WT% OF FEED 0.00

RUN NUMBER =H061278038

	MAX T ISO	MAX T NONISO	AVE T ISO	AVE T NONISO
REACTION TEMPERATURE (DEG F)	1590.0	1590.0	1510.9	1510.9
REACTION TIME (SEC)	0.769	0.408	0.800	0.960
STEAM-OIL MASS RATIO	0.722	0.722	0.722	0.722
PYROLYSIS SEVERITY FACTOR	1539.9	1482.4	1466.7	1482.9

GASEOUS PRODUCTS
WT % OF FEED 79.77
SCF/LB OF FEED15.64

COMPONENT	MOL %GAS	WT % GAS	WT % FEED	SCF/# FEED
HYDROGEN	27.68	2.88	2.30	4.33
CARBON MONOXIDE	15.15	21.90	17.47	2.37
METHANE	24.16	20.01	15.96	3.78
PROPANE	0.12	0.28	0.22	0.02
PROPYLENE	4.70	10.20	8.14	0.73
N-BUTANE	0.09	0.28	0.22	0.01
HYDROGEN SULFIDE	0.00	0.00	0.00	0.00
1-BUTENE	0.33	0.96	0.77	0.05
ISOBUTYLENE	0.00	0.00	0.00	0.00
TRANS-2-BUTENE	0.22	0.65	0.52	0.04
CIS-2-BUTENE	0.04	0.12	0.10	0.01
1-3 BUTADIENE	1.35	3.79	3.03	0.21
CARBON DIOXIDE	0.93	2.22	1.77	0.15
ETHYLENE	23.39	33.88	27.02	3.66
ETHANE	1.82	2.83	2.25	0.28
ISOBUTANE	0.00	0.00	0.00	0.00

LIQUID PRODUCTS
WT % OF FEED 20.23

SOLID PRODUCTS
WT% OF FEED 0.00

RUN NUMBER =H061378039

	MAX T ISO	MAX T NONISO	AVE T ISO	AVE T NONISO
REACTION TEMPERATURE (DEG F)	1467.0	1467.0	1401.6	1401.6
REACTION TIME (SEC)	0.815	0.442	0.844	0.977
STEAM-OIL MASS RATIO	0.697	0.697	0.697	0.697
PYROLYSIS SEVERITY FACTOR	1423.2	1371.8	1362.5	1374.6

GASEOUS PRODUCTS
WT % OF FEED 61.32
SCF/LB OF FEED 9.53

COMPONENT	MOL %GAS	WT % GAS	WT % FEED	SCF/# FEED
HYDROGEN	13.65	1.13	0.69	1.30
CARBON MONOXIDE	6.25	7.16	4.39	0.60
METHANE	28.17	18.50	11.34	2.69
PROPANE	0.37	0.66	0.41	0.03
PROPYLENE	10.71	18.45	11.32	1.02
N-BUTANE	0.15	0.35	0.22	0.01
HYDROGEN SULFIDE	0.04	0.05	0.03	0.00
1-BUTENE	1.60	3.68	2.26	0.15
ISOBUTYLENE	0.00	0.00	0.00	0.00
TRANS-2-BUTENE	0.43	0.98	0.60	0.04
CIS-2-BUTENE	0.13	0.31	0.19	0.01
1-3 BUTADIENE	3.76	8.32	5.10	0.36
CARBON DIOXIDE	0.33	0.61	0.38	0.03
ETHYLENE	31.03	35.63	21.85	2.96
ETHANE	3.39	4.17	2.55	0.32
ISOBUTANE	0.00	0.00	0.00	0.00

LIQUID PRODUCTS
WT % OF FEED 38.68

SOLID PRODUCTS
WT% OF FEED 0.00

RUN NUMBER =H061478048

	MAX T ISO	MAX T NONISO	AVE T ISO	AVE T NONISO
REACTION TEMPERATURE (DEG F)	1354.0	1354.0	1314.9	1314.9
REACTION TIME (SEC)	0.714	0.519	0.730	0.881
STEAM-OIL MASS RATIO	0.846	0.846	0.846	0.846
PYROLYSIS SEVERITY FACTOR	1315.9	1290.9	1279.5	1294.0

GASEOUS PRODUCTS
WT % OF FEED 51.86
SCF/LB OF FEED 7.30

COMPONENT	MOL %GAS	WT % GAS	WT % FEED	SCF/# FEED
HYDROGEN	11.73	0.88	0.46	0.86
CARBON MONOXIDE	5.93	6.16	3.19	0.43
METHANE	23.01	13.68	7.09	1.68
PROPANE	0.69	1.13	0.59	0.05
PROPYLENE	14.64	22.83	11.84	1.07
N-BUTANE	0.14	0.30	0.16	0.01
HYDROGEN SULFIDE	0.04	0.05	0.02	0.00
1-BUTENE	4.26	8.85	4.59	0.31
ISOBUTYLENE	0.00	0.00	0.00	0.00
TRANS-2-BUTENE	0.57	1.19	0.62	0.04
CIS-2-BUTENE	0.30	0.63	0.33	0.02
1-3 BUTADIENE	3.76	7.54	3.91	0.27
CARBON DIOXIDE	0.29	0.49	0.26	0.02
ETHYLENE	30.30	31.50	16.33	2.21
ETHANE	4.29	4.78	2.48	0.31
ISOBUTANE	0.00	0.00	0.00	0.00

LIQUID PRODUCTS
WT % OF FEED 48.14

SOLID PRODUCTS
WT% OF FEED 0.00

RUN NUMBER =ND61578041

	MAX T ISO	MAX T NONISO	AVE T ISO	AVE T NONISO
REACTION TEMPERATURE (DEG F)	1489.0	1489.0	1411.3	1411.3
REACTION TIME (SEC)	0.990	0.500	1.031	1.266
STEAM-OIL MASS RATIO	0.779	0.779	0.779	0.779
PYROLYSIS SEVERITY FACTOR	1469.6	1410.6	1396.3	1413.6

GASEOUS PRODUCTS
WT % OF FEED 70.84
SCF/LB OF FEED11.15

COMPONENT	MOL %GAS	WT % GAS	WT % FEED	SCF/# FEED
HYDROGEN	13.01	1.09	0.77	1.45
CARBON MONOXIDE	6.53	7.59	5.37	0.73
METHANE	29.20	19.42	13.76	3.26
PROPANE	0.35	0.65	0.46	0.04
PROPYLENE	10.31	17.99	12.74	1.15
N-BUTANE	0.14	0.35	0.25	0.02
HYDROGEN SULFIDE	0.03	0.05	0.03	0.00
1-BUTENE	1.37	3.19	2.26	0.15
ISOBUTYLENE	0.00	0.00	0.00	0.00
TRANS-2-BUTENE	0.41	0.95	0.67	0.05
CIS-2-BUTENE	0.12	0.27	0.19	0.01
1-3 BUTADIENE	2.72	6.11	4.33	0.30
CARBON DIOXIDE	0.58	1.10	0.78	0.06
ETHYLENE	31.74	36.92	26.15	3.54
ETHANE	3.48	4.33	3.07	0.39
ISOBUTANE	0.00	0.00	0.00	0.00

LIQUID PRODUCTS
WT % OF FEED 29.16

SOLID PRODUCTS
WT% OF FEED 0.00

RUN NUMBER =H061678042

	MAX T ISO	MAX T NONISO	AVE T ISO	AVE T NONISO
REACTION TEMPERATURE (DEG F)	1628.0	1628.0	1578.9	1578.9
REACTION TIME (SEC)	0.579	0.392	0.593	0.650
STEAM-OIL MASS RATIO	0.463	0.463	0.463	0.463
PYROLYSIS SEVERITY FACTOR	1515.9	1481.0	1472.2	1480.4

GASEOUS PRODUCTS

WT % OF FEED 89.16

SCF/LB OF FEED19.29

COMPONENT	MOL %GAS	WT % GAS	WT % FEED	SCF/# FEED
HYDROGEN	33.93	3.90	3.47	6.54
CARBON MONOXIDE	16.69	26.62	23.73	3.22
METHANE	22.31	20.39	18.18	4.30
PROPANE	0.07	0.18	0.16	0.01
PROPYLENE	3.27	7.84	6.99	0.63
N-BUTANE	0.08	0.27	0.24	0.02
HYDROGEN SULFIDE	0.00	0.00	0.00	0.00
1-BUTENE	0.14	0.45	0.40	0.03
ISOBUTYLENE	0.00	0.00	0.00	0.00
TRANS-2-BUTENE	0.19	0.60	0.54	0.04
CIS-2-BUTENE	0.01	0.05	0.04	0.00
1-3 BUTADIENE	0.95	2.93	2.61	0.18
CARBON DIOXIDE	0.88	2.29	2.05	0.17
ETHYLENE	20.11	32.13	28.65	3.88
ETHANE	1.37	2.35	2.09	0.26
ISOBUTANE	0.00	0.00	0.00	0.00

LIQUID PRODUCTS

WT % OF FEED 10.84

SOLID PRODUCTS

WT% OF FEED 0.00

RUN NUMBER =H062078043

	MAX T ISO	MAX T NONISO	AVE T ISO	AVE T NONISO
REACTION TEMPERATURE (DEG F)	1603.0	1603.0	1548.4	1548.4
REACTION TIME (SEC)	0.431	0.271	0.443	0.482
STEAM-OIL MASS RATIO	0.687	0.687	0.687	0.687
PYROLYSIS SEVERITY FACTOR	1495.8	1454.7	1447.2	1454.6

GASEOUS PRODUCTS

WT % OF FEED 91.49

SCF/LB OF FEED20.34

COMPONENT	MOL %GAS	WT % GAS	WT % FEED	SCF/# FEED
HYDROGEN	38.33	4.52	4.14	7.80
CARBON MONOXIDE	21.68	35.54	32.52	4.41
METHANE	16.80	15.78	14.43	3.42
PROPANE	0.09	0.23	0.21	0.02
PROPYLENE	3.13	7.70	7.05	0.64
N-BUTANE	0.05	0.17	0.15	0.01
HYDROGEN SULFIDE	0.00	0.00	0.00	0.00
1-BUTENE	0.23	0.76	0.70	0.05
ISOBUTYLENE	0.00	0.00	0.00	0.00
TRANS-2-BUTENE	0.12	0.40	0.37	0.02
CIS-2-BUTENE	0.03	0.09	0.08	0.01
1-3 BUTADIENE	0.95	3.02	2.77	0.19
CARBON DIOXIDE	1.04	2.81	2.57	0.21
ETHYLENE	16.14	26.51	24.25	3.28
ETHANE	1.40	2.47	2.26	0.28
ISOBUTANE	0.00	0.00	0.00	0.00

LIQUID PRODUCTS

WT % OF FEED 8.51

SOLID PRODUCTS

WT% OF FEED 0.00

RUN NUMBER =M062178044

	MAX T ISO	MAX T NONISO	AVE T ISO	AVE T NONISO
REACTION TEMPERATURE (DEG F)	1576.0	1576.0	1508.6	1508.6
REACTION TIME (SEC)	0.388	0.220	0.401	0.459
STEAM-OIL MASS RATIO	0.730	0.730	0.730	0.730
PYROLYSIS SEVERITY FACTOR	1465.7	1416.7	1405.9	1417.2

GASEOUS PRODUCTS

WT % OF FEED 59.83

SCF/LB OF FEED 9.61

COMPONENT	MOL %GAS	WT % GAS	WT % FEED	SCF/# FEED
HYDROGEN	11.79	1.01	0.60	1.13
CARBON MONOXIDE	4.13	4.89	2.92	0.40
METHANE	32.04	21.74	13.01	3.08
PROPANE	0.24	0.45	0.27	0.02
PROPYLENE	8.88	15.80	9.45	0.85
N-BUTANE	0.19	0.47	0.28	0.02
HYDROGEN SULFIDE	0.00	0.00	0.00	0.00
1-BUTENE	0.80	1.90	1.14	0.08
ISOBUTYLENE	0.00	0.00	0.00	0.00
TRANS-2-BUTENE	0.47	1.11	0.66	0.04
CIS-2-BUTENE	0.08	0.20	0.12	0.01
1-3 BUTADIENE	2.64	6.03	3.61	0.25
CARBON DIOXIDE	0.26	0.51	0.30	0.02
ETHYLENE	35.61	42.25	25.28	3.42
ETHANE	2.87	3.65	2.18	0.28
ISOBUTANE	0.00	0.00	0.00	0.00

LIQUID PRODUCTS

WT % OF FEED 40.17

SOLID PRODUCTS

WT% OF FEED 0.00

RUN NUMBER =H06227804S

	MAX T ISO	MAX T NONISO	AVE T ISO	AVE T NONISO
REACTION TEMPERATURE (DEG F)	1464.0	1464.0	1400.4	1400.4
REACTION TIME (SEC)	0.377	0.200	0.390	0.434
STEAM-OIL MASS RATIO	0.727	0.727	0.727	0.727
PYROLYSIS SEVERITY FACTOR	1358.9	1308.2	1302.5	1310.9

GASEOUS PRODUCTS

WT % OF FEED 60.45

SCF/LB OF FEED 8.65

COMPONENT	MOL %GAS	WT % GAS	WT % FEED	SCF/# FEED
HYDROGEN	9.46	0.72	0.43	0.82
CARBON MONOXIDE	3.54	3.73	2.26	0.31
METHANE	26.42	15.98	9.66	2.29
PROPANE	0.45	0.75	0.45	0.04
PROPYLENE	13.47	21.37	12.92	1.17
N-BUTANE	0.18	0.40	0.24	0.02
HYDROGEN SULFIDE	0.00	0.00	0.00	0.00
1-BUTENE	2.85	6.03	3.65	0.25
ISOBUTYLENE	0.00	0.00	0.00	0.00
TRANS-2-BUTENE	0.53	1.13	0.68	0.05
CIS-2-BUTENE	0.20	0.43	0.26	0.02
1-3 BUTADIENE	3.75	7.66	4.63	0.32
CARBON DIOXIDE	0.26	0.45	0.27	0.02
ETHYLENE	35.57	37.61	22.74	3.08
ETHANE	3.31	3.76	2.27	0.29
ISOBUTANE	0.00	0.00	0.00	0.00

LIQUID PRODUCTS

WT % OF

RUN NUMBER =H062378046

	MAX T ISO	MAX T NONISO	AVE T ISO	AVE T NONISO
REACTION TEMPERATURE (DEG F)	1335.0	1335.0	1298.6	1298.6
REACTION TIME (SEC)	0.396	0.258	0.404	0.426
STEAM-OIL MASS RATIO	0.773	0.773	0.773	0.773
PYROLYSIS SEVERITY FACTOR	1246.6	1215.0	1214.1	1217.9

GASEOUS PRODUCTS

WT % OF FEED 41.48

SCF/LB OF FEED 5.82

COMPONENT	MOL %GAS	WT % GAS	WT % FEED	SCF/# FEED
HYDROGEN	8.51	0.63	0.26	0.50
CARBON MONOXIDE	3.11	3.22	1.34	0.18
METHANE	26.13	15.49	6.43	1.52
PROPANE	0.55	0.90	0.37	0.03
PROPYLENE	14.77	22.97	9.53	0.86
N-BUTANE	0.22	0.47	0.19	0.01
HYDROGEN SULFIDE	0.00	0.00	0.00	0.00
1-BUTENE	3.48	7.22	3.00	0.20
ISOBUTYLENE	0.00	0.00	0.00	0.00
TRANS-2-BUTENE	0.56	1.15	0.48	0.03
CIS-2-BUTENE	0.24	0.50	0.21	0.01
1-3 BUTADIENE	3.17	6.34	2.63	0.18
CARBON DIOXIDE	0.19	0.32	0.13	0.01
ETHYLENE	35.12	36.40	15.10	2.04
ETHANE	3.95	4.39	1.82	0.23
ISOBUTANE	0.00	0.00	0.00	0.00

LIQUID PRODUCTS

WT % OF FEED 58.52

SOLID PRODUCTS

WT% OF FEED 0.00

RUN NUMBER =H06278047

	MAX T ISO	MAX T NONISO	AVE T ISO	AVE T NONISO
REACTION TEMPERATURE (DEG F)	1585.0	1585.0	1498.0	1498.0
REACTION TIME (SEC)	1.359	0.678	1.419	1.752
STEAM-OIL MASS RATIO	0.357	0.357	0.357	0.357
PYROLYSIS SEVERITY FACTOR	1533.3	1470.7	1452.9	1471.4

GASEOUS PRODUCTS

WT % OF FEED 60.93

SCF/LB OF FEED10.64

COMPONENT	MOL %GAS	WT % GAS	WT % FEED	SCF/# FEED
HYDROGEN	14.21	1.32	0.80	1.51
CARBON MONOXIDE	7.49	9.65	5.88	0.80
METHANE	34.95	25.79	15.71	3.72
PROPANE	0.13	0.25	0.15	0.01
PROPYLENE	5.85	11.32	6.90	0.62
N-BUTANE	0.08	0.21	0.13	0.01
HYDROGEN SULFIDE	0.00	0.00	0.00	0.00
1-BUTENE	0.37	0.95	0.58	0.04
ISOBUTYLENE	0.00	0.00	0.00	0.00
TRANS-2-BUTENE	0.26	0.68	0.41	0.03
CIS-2-BUTENE	0.05	0.12	0.07	0.01
1-3 BUTADIENE	1.59	3.94	2.40	0.17
CARBON DIOXIDE	0.38	0.81	0.49	0.04
ETHYLENE	32.01	41.30	25.17	3.41
ETHANE	2.64	3.65	2.23	0.28
ISOBUTANE	0.00	0.00	0.00	0.00

LIQUID PRODUCTS

WT % OF FEED 39.07

SOLID PRODUCTS

WT% OF FEED 0.00

RUN NUMBER =M062778048

	MAX T ISO	MAX T NONISO	AVE T ISO	AVE T NONISO
REACTION TEMPERATURE (DEG F)	1588.0	1588.0	1500.6	1500.6
REACTION TIME (SEC)	0.730	0.361	0.763	0.935
STEAM-OIL MASS RATIO	0.752	0.752	0.752	0.752
PYROLYSIS SEVERITY FACTOR	1536.3	1472.7	1455.6	1473.4

GASEOUS PRODUCTS

WT % OF FEED 60.41

SCF/LB OF FEED10.26

COMPONENT	MOL %GAS	WT % GAS	WT % FEED	SCF/# FEED
HYDROGEN	14.08	1.27	0.77	1.45
CARBON MONOXIDE	7.43	9.31	5.63	0.76
METHANE	32.81	23.55	14.22	3.37
PROPANE	0.19	0.37	0.22	0.02
PROPYLENE	6.79	12.78	7.72	0.70
N-BUTANE	0.12	0.32	0.19	0.01
HYDROGEN SULFIDE	0.00	0.00	0.00	0.00
1-BUTENE	0.55	1.37	0.83	0.06
ISOBUTYLENE	0.00	0.00	0.00	0.00
TRANS-2-BUTENE	0.35	0.87	0.53	0.04
CIS-2-BUTENE	0.05	0.14	0.08	0.01
1-3 BUTADIENE	1.99	4.83	2.92	0.20
CARBON DIOXIDE	0.31	0.64	0.39	0.03
ETHYLENE	32.85	41.23	24.91	3.37
ETHANE	2.48	3.33	2.01	0.25
ISOBUTANE	0.00	0.00	0.00	0.00

LIQUID PRODUCTS

WT % OF FEED 39.59

SOLID PRODUCTS

WT% OF FEED 0.00

RUN NUMBER =M062878049

	MAX T ISO	MAX T NONISO	AVE T ISO	AVE T NONISO
REACTION TEMPERATURE (DEG F)	1471.0	1471.0	1400.1	1400.1
REACTION TIME (SEC)	0.736	0.379	0.765	0.895
STEAM-OIL MASS RATIO	0.780	0.780	0.780	0.780
PYROLYSIS SEVERITY FACTOR	1426.4	1370.6	1360.8	1373.6

GASEOUS PRODUCTS

WT % OF FEED 55.84

SCF/LB OF FEED 8.66

COMPONENT	MOL %GAS	WT % GAS	WT % FEED	SCF/# FEED
HYDROGEN	13.70	1.13	0.63	1.19
CARBON MONOXIDE	9.10	10.40	5.81	0.79
METHANE	26.14	17.11	9.56	2.26
PROPANE	0.36	0.65	0.36	0.03
PROPYLENE	10.87	18.67	10.43	0.94
N-BUTANE	0.16	0.38	0.21	0.01
HYDROGEN SULFIDE	0.02	0.03	0.02	0.00
1-BUTENE	1.70	3.90	2.18	0.15
ISOBUTYLENE	0.00	0.00	0.00	0.00
TRANS-2-BUTENE	0.44	1.01	0.56	0.04
CIS-2-BUTENE	0.15	0.34	0.19	0.01
1-3 BUTADIENE	2.84	6.26	3.50	0.25
CARBON DIOXIDE	0.43	0.81	0.45	0.04
ETHYLENE	30.80	35.26	19.69	2.67
ETHANE	3.30	4.04	2.26	0.29
ISOBUTANE	0.00	0.00	0.00	0.00

LIQUID PRODUCTS

WT % OF FEED 44.16

SOLID PRODUCTS

WT% OF FEED 0.00

RUN NUMBER =M062978050

	MAX T ISO	MAX T NONISO	AVE T ISO	AVE T NONISO
REACTION TEMPERATURE (DEG F)	1363.0	1363.0	1298.3	1298.3
REACTION TIME (SEC)	0.818	0.420	0.848	1.009
STEAM-OIL MASS RATIO	0.726	0.726	0.726	0.726
PYROLYSIS SEVERITY FACTOR	1325.2	1273.3	1265.1	1278.4

GASEOUS PRODUCTS
WT % OF FEED 49.33
SCF/LB OF FEED 7.06

COMPONENT	MOL %GAS	WT % GAS	WT % FEED	SCF/# FEED
HYDROGEN	11.00	0.84	0.41	0.78
CARBON MONOXIDE	5.73	6.04	2.98	0.40
METHANE	24.69	14.91	7.36	1.74
PROPANE	0.48	0.79	0.39	0.03
PROPYLENE	14.43	22.88	11.29	1.02
N-BUTANE	0.14	0.31	0.15	0.01
HYDROGEN SULFIDE	0.03	0.04	0.02	0.00
1-BUTENE	3.60	7.61	3.75	0.25
ISOBUTYLENE	0.00	0.00	0.00	0.00
TRANS-2-BUTENE	0.53	1.11	0.55	0.04
CIS-2-BUTENE	0.27	0.56	0.28	0.02
1-3 BUTADIENE	3.28	6.67	3.29	0.23
CARBON DIOXIDE	0.11	0.19	0.09	0.01
ETHYLENE	31.70	33.49	16.52	2.24
ETHANE	4.02	4.55	2.25	0.28
ISOBUTANE	0.00	0.00	0.00	0.00

LIQUID PRODUCTS
WT % OF FEED 50.67

SOLID PRODUCTS
WT% OF FEED 0.00

RUN NUMBER =H063078051

	MAX T ISO	MAX T NONISO	AVE T ISO	AVE T NONISO
REACTION TEMPERATURE (DEG F)	1470.0	1470.0	1402.4	1402.4
REACTION TIME (SEC)	1.143	0.637	1.184	1.445
STEAM-OIL MASS RATIO	0.642	0.642	0.642	0.642
PYROLYSIS SEVERITY FACTOR	1449.3	1399.4	1385.6	1402.3

GASEOUS PRODUCTS

WT % OF FEED 57.36

SCF/LB OF FEED 8.76

COMPONENT	MOL %GAS	WT % GAS	WT % FEED	SCF/# FEED
HYDROGEN	12.99	1.05	0.60	1.14
CARBON MONOXIDE	8.61	9.70	5.56	0.75
METHANE	26.42	17.04	9.77	2.31
PROPANE	0.42	0.75	0.43	0.04
PROPYLENE	11.40	19.29	11.06	1.00
N-BUTANE	0.14	0.34	0.19	0.01
HYDROGEN SULFIDE	0.02	0.03	0.02	0.00
1-BUTENE	2.02	4.57	2.62	0.18
ISOBUTYLENE	0.00	0.00	0.00	0.00
TRANS-2-BUTENE	0.44	0.99	0.57	0.04
CIS-2-BUTENE	0.21	0.47	0.27	0.02
1-3 BUTADIENE	2.78	6.04	3.46	0.24
CARBON DIOXIDE	0.66	1.23	0.70	0.06
ETHYLENE	29.96	33.79	19.38	2.62
ETHANE	3.92	4.73	2.71	0.34
ISOBUTANE	0.00	0.00	0.00	0.00

LIQUID PRODUCTS

WT % OF FEED 42.64

SOLID PRODUCTS

WT% OF FEED 0.00

RUN NUMBER =R070578052

	MAX T ISO	MAX T NONISO	AVE T ISO	AVE T NONISO
REACTION TEMPERATURE (DEG F)	1629.0	1629.0	1560.3	1560.3
REACTION TIME (SEC)	0.414	0.233	0.429	0.476
STEAM-OIL MASS RATIO	0.727	0.727	0.727	0.727
PYROLYSIS SEVERITY FACTOR	1520.7	1469.2	1459.5	1468.7

GASEOUS PRODUCTS

WT % OF FEED 62.22

SCF/LB OF FEED10.64

COMPONENT	MOL %GAS	WT % GAS	WT % FEED	SCF/# FEED
HYDROGEN	13.59	1.23	0.77	1.45
CARBON MONOXIDE	3.70	4.67	2.90	0.39
METHANE	34.72	25.08	15.60	3.69
PROPANE	0.14	0.28	0.18	0.02
PROPYLENE	6.71	12.71	7.91	0.71
N-BUTANE	0.18	0.46	0.29	0.02
HYDROGEN SULFIDE	0.00	0.00	0.00	0.00
1-BUTENE	0.44	1.11	0.69	0.05
ISOBUTYLENE	0.00	0.00	0.00	0.00
TRANS-2-BUTENE	0.41	1.04	0.65	0.04
CIS-2-BUTENE	0.04	0.10	0.06	0.00
1-3 BUTADIENE	1.99	4.85	3.02	0.21
CARBON DIOXIDE	0.23	0.47	0.29	0.02
ETHYLENE	35.70	45.09	28.06	3.80
ETHANE	2.15	2.91	1.81	0.23
ISOBUTANE	0.00	0.00	0.00	0.00

LIQUID PRODUCTS

WT % OF FEED 37.78

SOLID PRODUCTS

WT% OF FEED 0.00

RUN NUMBER =D071178001

	MAX T ISO	MAX T NONISO	AVE T ISO	AVE T NONISO
REACTION TEMPERATURE (DEG F)	1370.0	1370.0	1323.7	1323.7
REACTION TIME (SEC)	0.988	0.602	1.014	1.115
STEAM-OIL MASS RATIO	0.422	0.422	0.422	0.422
PYROLYSIS SEVERITY FACTOR	1311.2	1272.8	1268.9	1276.1

GASEOUS PRODUCTS

WT % OF FEED 85.30

SCF/LB OF FEED11.63

COMPONENT	MOL %GAS	WT % GAS	WT % FEED	SCF/# FEED
HYDROGEN	7.42	0.54	0.46	0.86
CARBON MONOXIDE	6.97	7.01	5.98	0.81
METHANE	18.84	10.85	9.26	2.19
PROPANE	0.48	0.76	0.65	0.06
PROPYLENE	14.26	21.55	18.38	1.66
N-BUTANE	0.17	0.36	0.30	0.02
HYDROGEN SULFIDE	0.00	0.00	0.00	0.00
1-BUTENE	3.39	6.84	5.83	0.39
ISOBUTYLENE	0.00	0.00	0.00	0.00
TRANS-2-BUTENE	0.28	0.56	0.48	0.03
CIS-2-BUTENE	0.17	0.34	0.29	0.02
1-3 BUTADIENE	2.34	4.54	3.87	0.27
CARBON DIOXIDE	0.37	0.62	0.53	0.04
ETHYLENE	39.53	39.82	33.96	4.60
ETHANE	5.77	6.22	5.31	0.67
ISOBUTANE	0.00	0.00	0.00	0.00

LIQUID PRODUCTS

WT % OF FEED 14.70

SOLID PRODUCTS

WT% OF FEED 0.00