Flare system used at Gulf Oil chemicals Co., Orange, Tx
Gas phase ~~for~~ HDPE.

Design capacity of 200,000 lb/h with 25,000 lbs/h ethylene
Flare Ht – 200 ft
dia – 24 in.

Includes steam jets
natural gas pilots with an igniter

Estimated cost of flare & filters ⇒ $2,750,000 in 1980
op. cost $7,000 in 1980.

OMB Approval Number 158 S 72019

24-11

Questionnaire

Air Pollution Control Engineering and Cost Study of the Petrochemical Industry

Please read instructions before completing questionnaire.

Subject chemical: Polyethylene, Low Density

Principal by-products: None

Parent corporation name: Gulf Oil Corporation

Subsidiary name: Gulf Oil Chemicals Company

Mailing address: Orange, Texas 77630

Plant name: Orange Works

Physical location: Orange, Texas

(include county and air quaility control region) Orange County, Texas, Region 10

Person EPA should contact regarding information supplied in this questionnaire

Name: B. C. Pryor

Title: Senior Engineer

Mailing address: Gulf Oil Chemicals Company

Orange, Texas 77630

Telephone number: (713) 886-7491 Extension 343

Date questionnaire completed: September 1, 1972

3 copies provided this section.

IV. Emission control device

For device shown on block diagram by number 101.

1. Engineering description.

This is a flare stack 100 feet tall, 20 inches inside diameter, equipped with steam rings to eliminate smoke, and operating at an estimated 3500°F at 4.6 feet per second average gas velocity. Feed gas to the flare passes through a water seal in an auxiliary tank to prevent back flash.

IV. Continued For device shown on block diagram by number 101.

2. Capital cost of emission control system.

(a) Capital cost

Major equipment cost $ 48,000

Total installed cost $ 165,660

Year	Cost
1960	71,000
1963	1,760
1965	50,000
1968	42,900

IV. Continued For device shown on block diagram by number 101 .

(b) Check list. Mark whether items listed are included in total cost included in IV.2.a. Do not give dollar value -

Yes	No	Cost	Explanation
X		Site development	
	X	Buildings	
	X	Laboratory equipment	
X		Stack	
X		Rigging etc.	
X		Piping	
X		Insulation	
X		Instruments	
X		Instrument panels	
X		Electrical	
X		Facilities outside battery limits*	
	X	Storage tanks, spheres drums, bins, silos	
	X	Catalysts	
	X	Spare parts and non-installed parts	

*Such as - process pipe lines such as steam, condensate, water, gas, fuel, air, fire, instrument and electric lines.

IV. Continued For device shown on block diagram by number 101 .

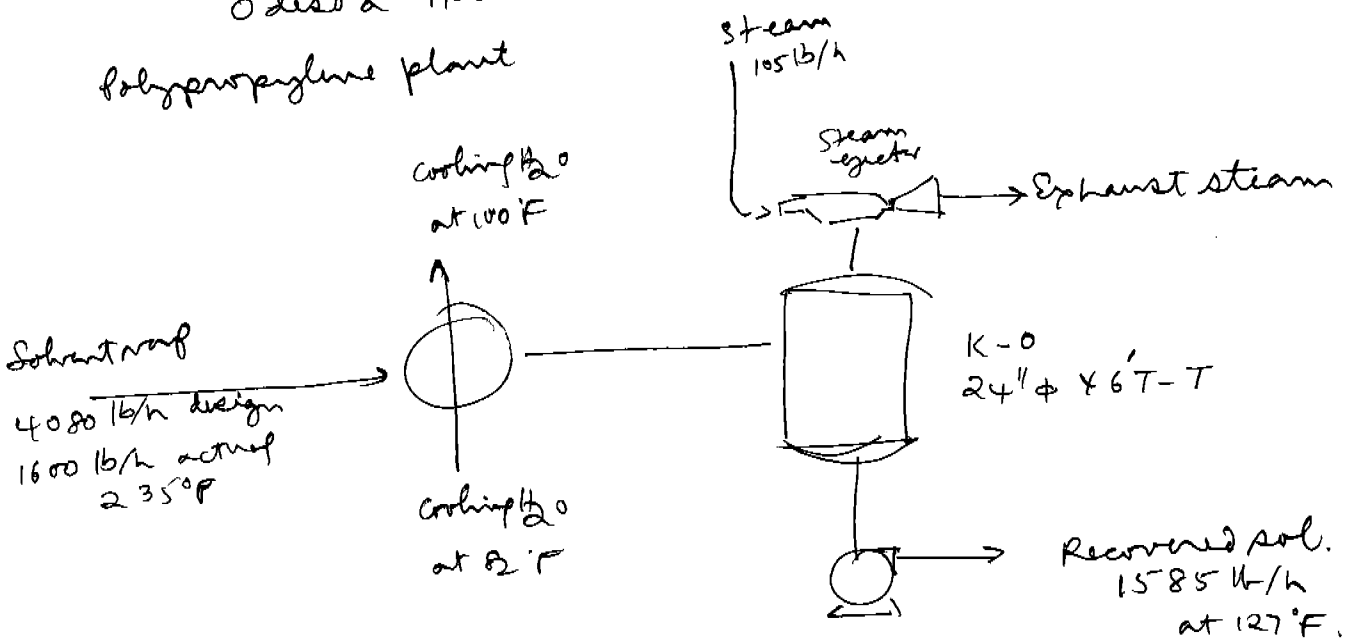
Yes	No	
	X	Was outside engineering contractor used?
	X	Was cost included in capital cost?
X		Was in-house engineering used?
X		Was cost included in capital cost?
	X	Was emission control equipment installed and constructed at the time plant (process) was constructed?

3. Operating costs of control system.

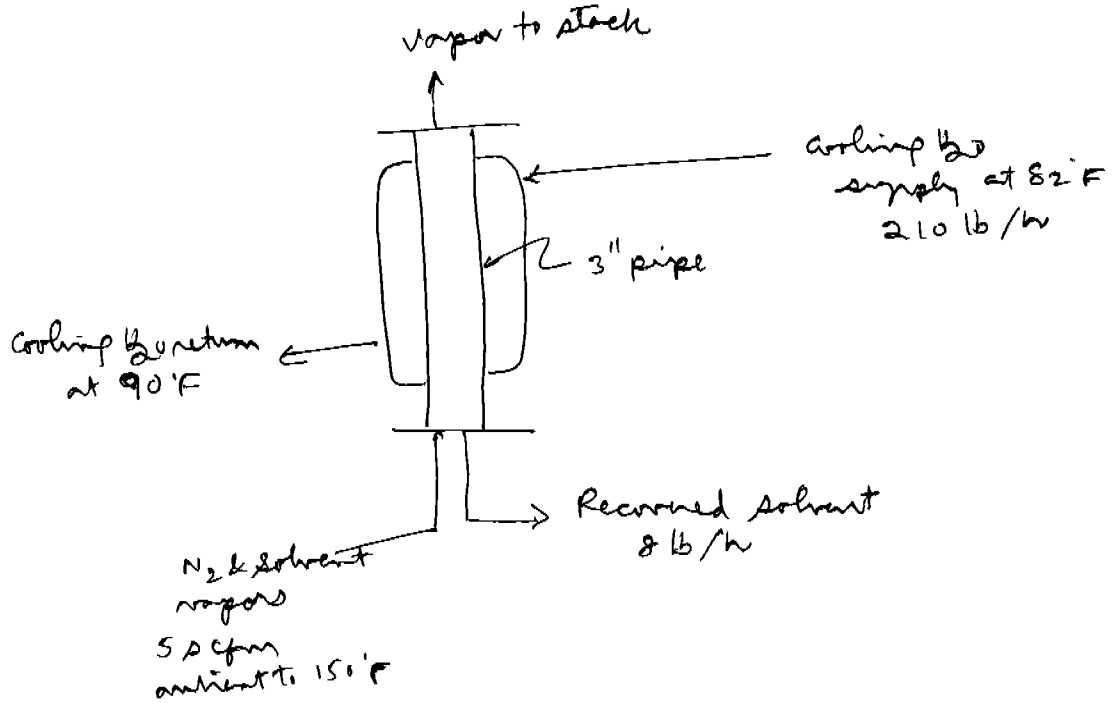
Give 1972 dollar values per year at capacity given in I.1.

(a)	Utilities	$ 2,500
(b)	Chemicals	-
(c)	Labor	500
(d)	Maintenance (labor & materials)	500
(e)	Water treatment (cost of treating any waste water produced by this control system)	-
(f)	Solids remmoval (cost of removing any waste solids produced by this control system)	-
(g)	Other disposal	-
(h)	By-product or product recovery CREDIT	(-)
	Total operating costs	$ 3,500

Rexene Polymers Co. Dart Industries Inc.
Odessa Tx.
Polypropylene plant



Condenser area - 630 ft²
op. pre 2 psia
cost $ 20,300 in 1970



cost = Major eqt $ 1,100
installed - $ 3,850
(in 1963 $ 1,750
1970 $ 2100
3,850)

Solters polymer Co. HDPE plant

Deer Park, TX 77536.

Flare System

24" Dia
240' ht
Flare tip, lighter, & mol. seal
Mfred by John Zink

Cost — Maj eqf $66,000
Total installed $150,000 in 1966.

op. cost — utilities $22,000.

The flare operates at 1500°F & 0.3 seconds retention time.

~~Natural gas — 12,775 MSCF/yr~~

OMB Approval Number 158 S 72019

25-6

Questionnaire

Air Pollution Control Engineering and Cost Study of the Petrochemical Industry

Please read instructions before completing questionnaire.

Subject chemical: Polypropylene

Principal by-products: None

Parent corporation name: Shell Oil Company

Subsidiary name: Shell Chemical Company, Polymers Division

Mailing address: Post Office Box 2463

Houston, Texas 77001

Plant name: Woodbury Chemical Plant

Physical location: Four Miles Southwest of Woodbury, New Jersey

(include county and air quality control region) Gloucester County, Metropolitan Philadelphia Interstate (Region II)

Person EPA should contact regarding information supplied in this questionnaire

Name: Dr. R. L. Maycock

Title: Manager, Environmental Engineering

Mailing address: Shell Chemical Company, Engineering Department

2525 Murworth Drive

Houston, Texas 77025

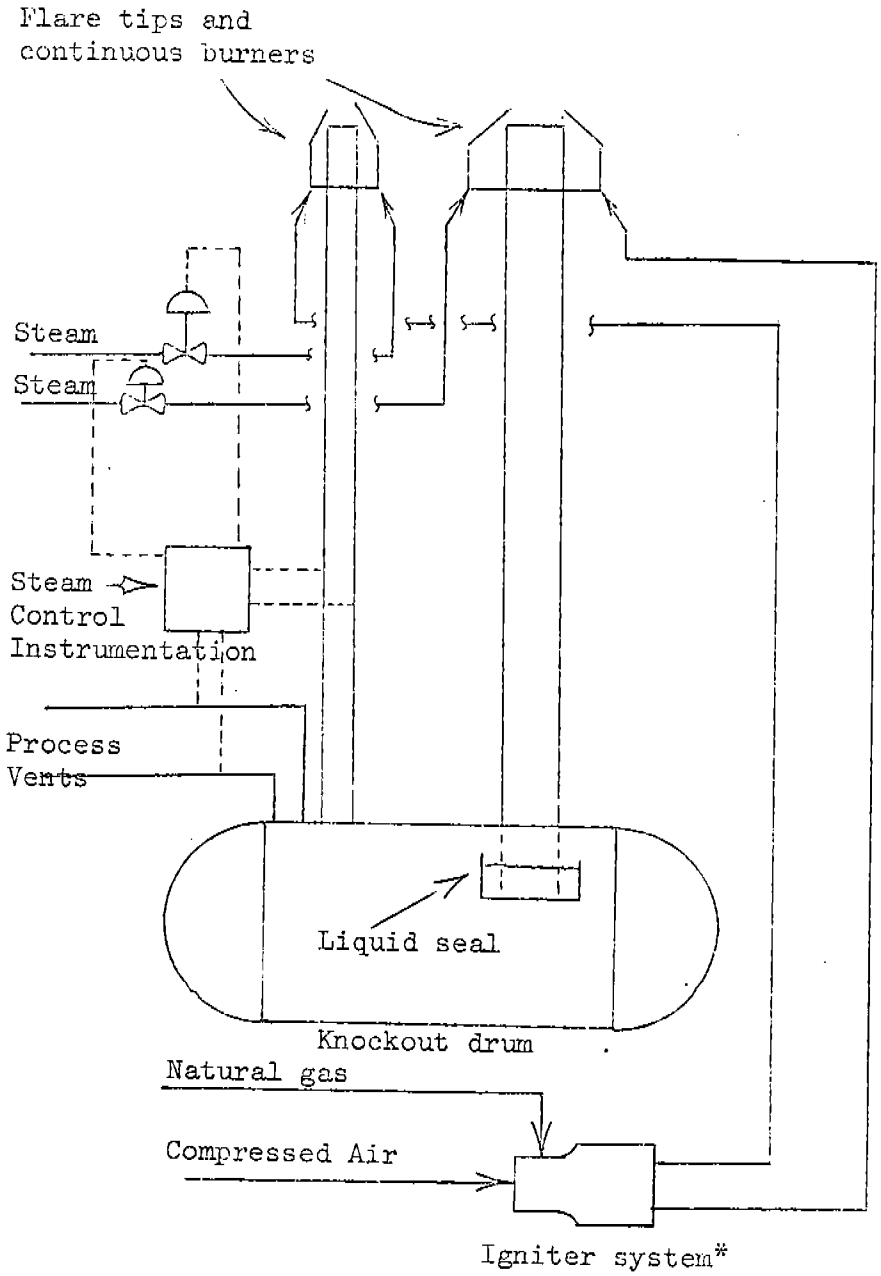
Telephone number: 713/666-6311 ext. 433

Date questionnaire completed: September 15, 1972

IV. Emission control device

For device shown on block diagram by number 101.

1. Engineering description.



Twin stack safety flare equipped with John Zink flare tips, continuous pilot burners, and igniter system.

Elevation: 250 ft. above grade

Stack diameters: 8 in. and .30 in.

Drum size: 10 ft. x 15 ft. T/T

Capacity: 760 M ACFM max.

Process Vent Temp: Ambient

Flame Temp: 3,500+ ^{o}F

Process Vent Rate: 1,500 SCFM (normal

Steam rate to flare tip is controlled to insure smokeless burning over a wide range of venting rates.

Utilities:

200 psig steam: 5000 lb/hr. (normal)
Natural gas: 30 SCFM
Compressed air: 50 SCFM

* This system is used only to relight flare and is used about 30 times per year for 3 minutes per occurrence.

IV. Continued For device shown on block diagram by number 101

2. Capital cost of emission control system.

(a) Capital cost

Major equipment cost	$ [illegible]
Total installed cost	$ [illegible]

Year	Cost
1962	$20,000
1970	2,000
1971	10,000
1972	[illegible]

*Knockout drum, flare stacks and derrick structure excluded as emission control systems.

(a)

IV. Continued For device shown on block diagram by number 101

(b) Check list. Mark whether items listed are included in total cost included in IV.2.a. Do not give dollar value -

Yes	No	Cost	Explanation
X		Site development	foundation for igniter station
	X	Buildings	
	X	Laboratory equipment	
	X	Stack	
X		Rigging etc.	
X		Piping	
X		Insulation	
X		Instruments	
	X	Instrument panels	
X		Electrical	
	X	Facilities outside battery limits*	
	X	Storage tanks, spheres drums, bins, silos	
	X	Catalysts	
	X	Spare parts and non-installed parts	

*Such as - process pipe lines such as steam, condensate, water, gas, fuel, air, fire, instrument and electric lines.

IV. Continued For device shown on block diagram by number 101

Yes	No	
X		Was outside engineering contractor used?
X		Was cost included in capital cost?
X		Was in-house engineering used?
	X	Was cost included in capital cost?
X		Was emission control equipment installed and constructed at the time plant (process) was constructed?

3. Operating costs of control system.

Give 1972 dollar values per year at capacity given in I.1.

(a)	Utilities	$ 91,000
(b)	Chemicals	0
(c)	Labor	2,000
(d)	Maintenance (labor & materials)	15,000
(e)	Water treatment (cost of treating any waste water produced by this control system)	-
(f)	Solids removal (cost of removing any waste solids produced by this control system)	-
(g)	Other disposal	-
(h)	By-product or product recovery CREDIT	(-)
	Total operating costs	$ 108,000

At Mobil chemical's polystyrene plant in Santa Ana, Calif there is a vapor condensing / recovery system.

From Enjay chem. Co. data

Ref. letter from Enjay to EPA on 9/26/72

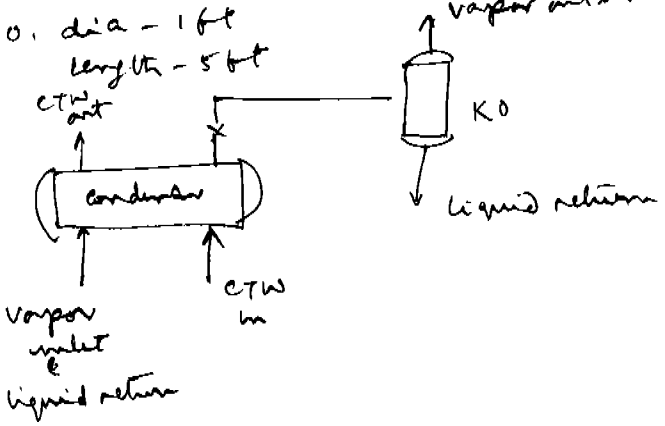
Polypropylene plant at Bay Town TX, Esso chemical Co.

- Vent gas knock out drum in safety relief system. Vapors vented to safety release stack

  Drum Dia = 20' } Installed cost in 1970 $100,000
  Drum ht = 10' } op. cost 2000/yr

- Alcohol condenser & knock-out vessel

  condenser area – 75 ft^2
  condensing medium – cooling tower water
  K-O. dia – 1 ft
  length – 5 ft



  cost = $10,000 in 1970
  op. cost 2000/yr

From city Service to data
Letter of June 29, 87 from
D.V. Trent of city Service to Dan Gordon

TABLE 8

FLARE SYSTEMS

Number from Flow Diagram	8	Manufacturer & Model No. (if available)	John Zink Steam Assisted, or Equal

CHARACTERISTICS OF INPUT

Waste Gas Stream	Material	Min. Value Expected (scfm [70°F, 14.7 psia])	Ave. Value Expected (scfm [70°F, 14.7 psia])	Design Max. (scfm [70°F, 14.7 psia])
	1.Ethtlene	6023	12046	22763
	2.Comonomer	321	642	1214
	3.Hydrogen	482	964	1821
	4.Catalyst	1204	2408	4552
	5. and others)			
	6.			
	7.			
	8.Total	8030	16060	30350
% of time this condition occurs				

	Flow Rate (scfm [70°F, 14.7 psia])		Temp. °F	Pressure (psig)
	Minimum Expected	Design Maximum		
Waste Gas Stream	15	80	50	ATM
Fuel Added to Gas Stream				

	Number of Pilots	Type Fuel	Fuel Flow Rate (scfm [70°F & 14.7 psia]) per pilot
	3	Methane	3.4

For Steam Injection	Steam Pressure (psig)		Total Steam Flow	Temp. °F	Velocity (ft/sec)
	Min. Expected	Design Max.	Rate (lb/hr)		
	150	175	34,700 MAX.	377	

Number of Jet Streams	Diameter of Steam Jets (inches)	Design basis for steam injected (lb steam/lb hydrocarbon)
		0.4

For Water Injection	Water Pressure (psig)		Total Water Flow Rate (gpm)		No. of Water Jets	Diameter of Water Jets (inches)
	Min. Expected	Design Max.	Min. Expected	Design Max.		

Flare Height (ft)	120	Flare tip inside diameter (ft)	2.5

Supply an assembly drawing, dimensioned and to scale, to show clearly the operation of the flare system. Show interior dimensions and features of the equipment necessary to calculate its performance. Also describe the type of ignition system and its method of operation. Provide an explanation of the control system for steam flow rate and other operating variables.

(1) Information is Preliminary But Typical for this Application
(2) Ignition system will be a vender supplied Flame Front Generator
(3) Steam Flow will be on flow ratio control with the Hydrocarbon vent rate.

Flare system

Max. vent rate of 200,000 lbs/h of ethylene with a max. smokeless rate of 25,000 lb/h Flare tt is 200 ft and tip dia is 24 in. Ft includes steam jets for smokeless burning, and natural gas pilots with an igniter.

CHKD. BY_____DATE_____ JOB NO._____

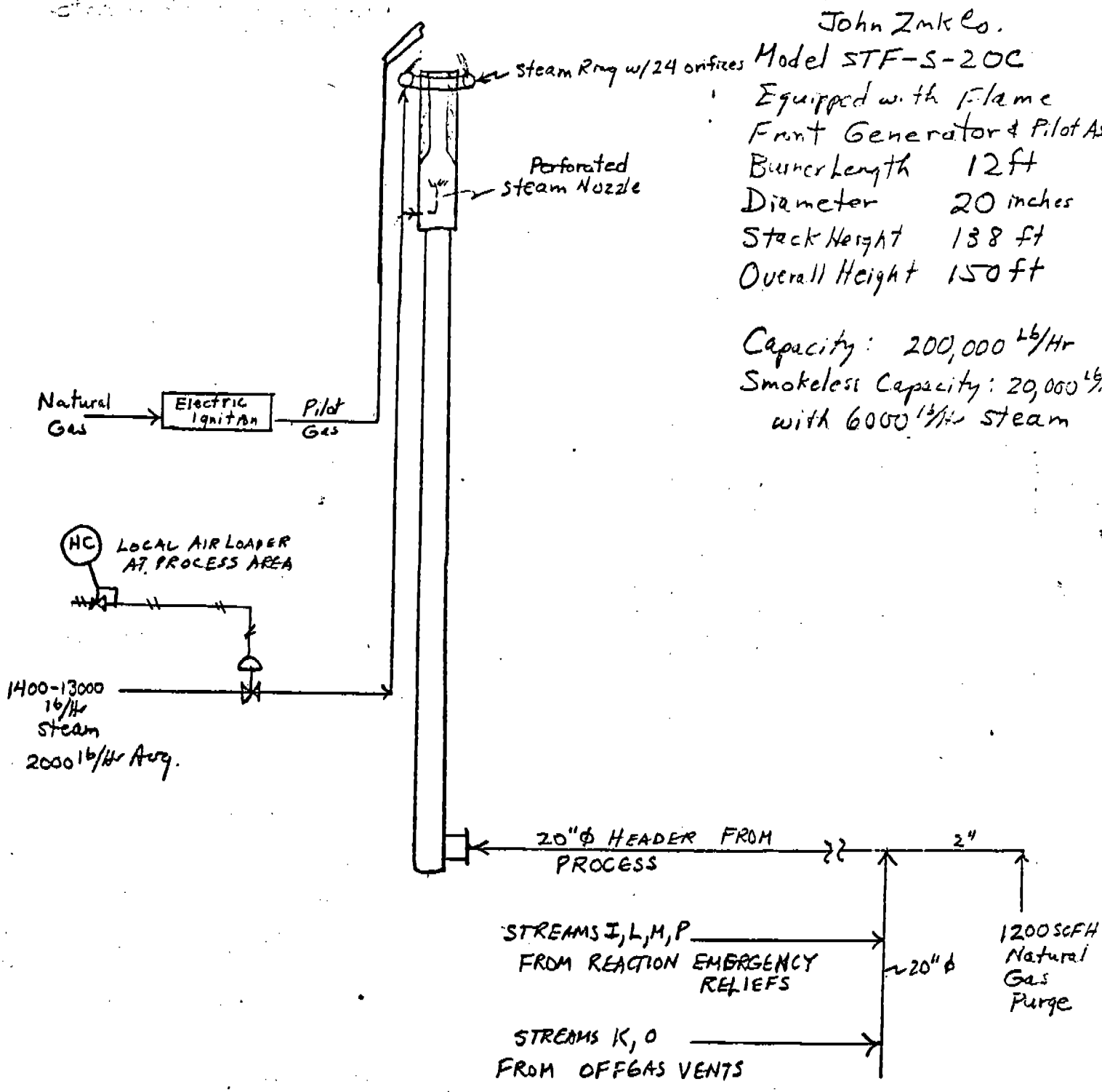
EMISSION DEVICE 106

ELEVATED FLARE

Diamond Shamrock Polypropylene plant at Deer Park, Tx.

MANUFACTURED BY:
John Zink Co.
Model STF-S-20C
Equipped with Flame Front Generator & Pilot Assy
Burner Length 12 ft
Diameter 20 inches
Stack Height 138 ft
Overall Height 150 ft

Capacity: 200,000 Lb/Hr
Smokeless Capacity: 20,000 Lb/Hr with 6000 Lb/Hr steam



IV. Continued For device shown on block diagram by number 106.

2. Capital cost of emission control system.

(a) Capital cost

Major equipment cost	$ not known
Total installed cost	$ 37,000

Year	Cost
1963	$35,000
1972	$ 2,000
	$37,000

IV. Continued For device shown on block diagram by number 106.

Yes	No	
X		Was outside engineering contractor used?
X		Was cost included in capital cost?
	X	Was in-house engineering used?
	X	Was cost included in capital cost?
X		Was emission control equipment installed and constructed at the time plant (process) was constructed?

3. Operating costs of control system.

Give 1972 dollar values per year at capacity given in I.1.

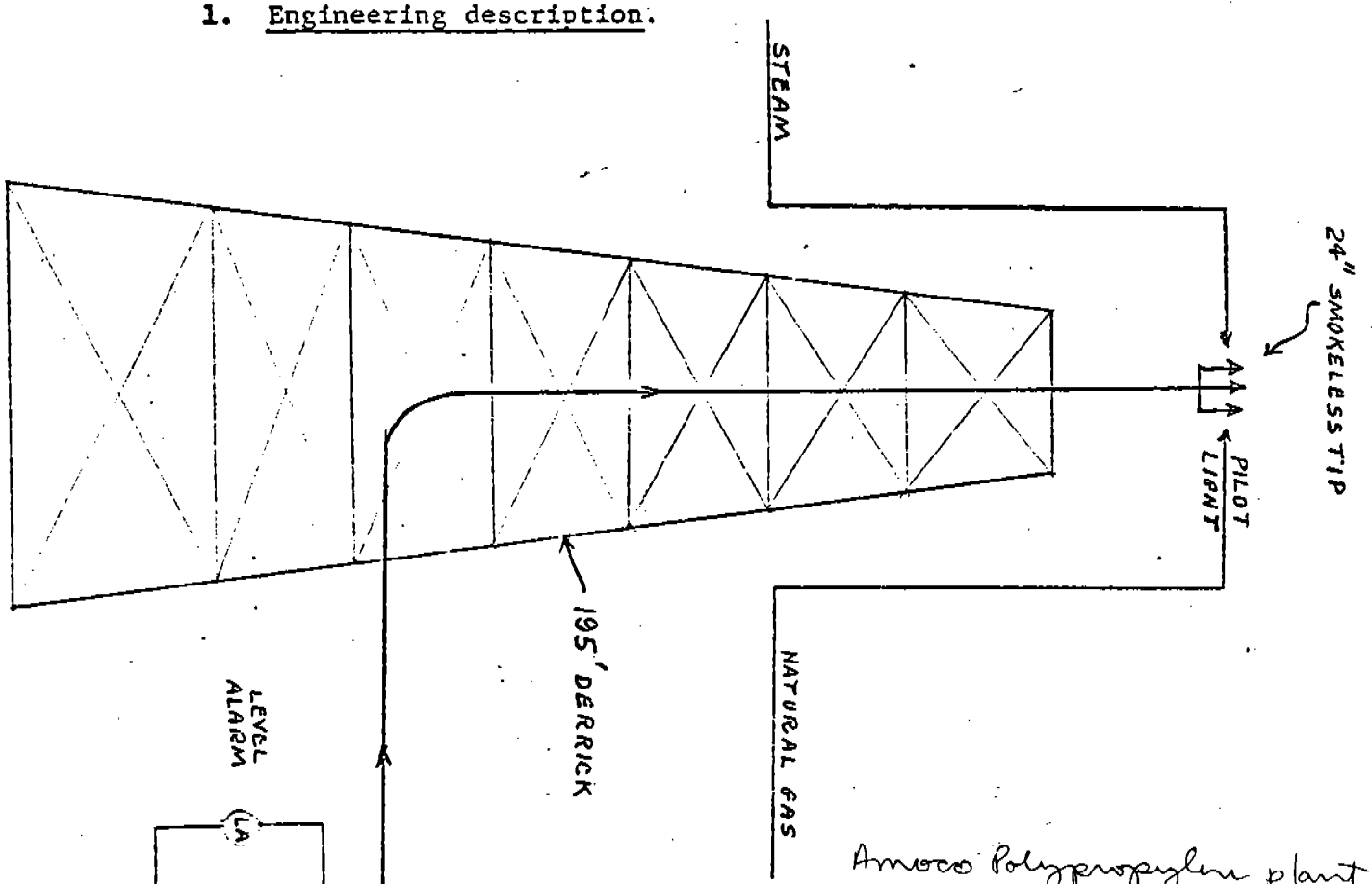
(a)	Utilities *	$ 12,000
(b)	Chemicals	----
(c)	Labor	1,000
(d)	Maintenance (labor & materials)	1,000
(e)	Water treatment (cost of treating any waste water produced by this control system)	-----
(f)	Solids remmoval (cost of removing any waste solids produced by this control system)	----
(g)	Other disposal	----
(h)	By-product or product recovery CREDIT	(0)
	Total operating costs	$ 14,000

3 copies provided this section.

IV. Emission control device

For device shown on block diagram by number 101 .

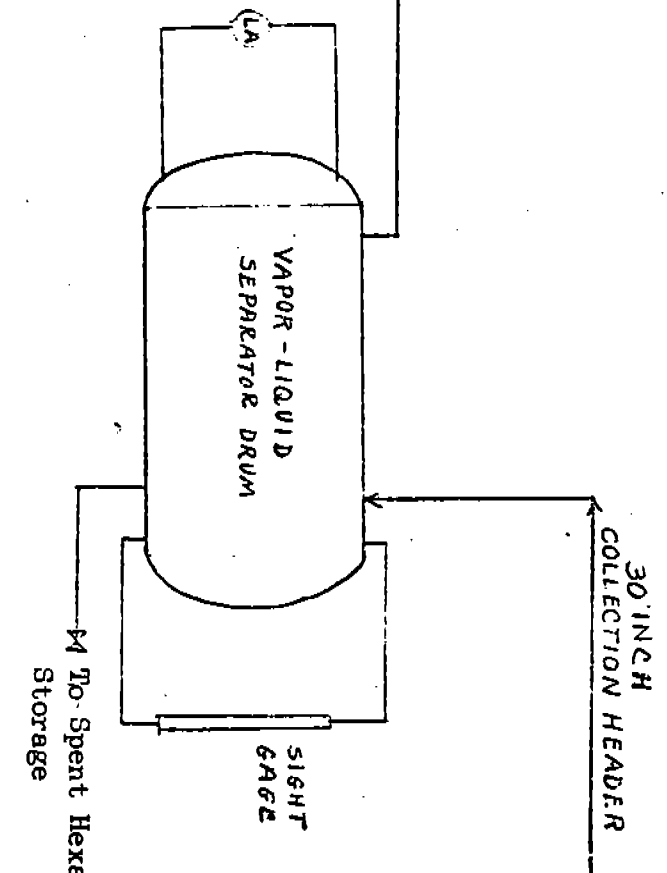
1. Engineering description.



Amoco Polypropylene plant
Alvin, Tx

Flare and Derrick

Manufacturer: John Zink Co.
Smokeless Flame No.: STF-S-24 Flare Tip Assembly
Smokeless Flare Height: 200'
Derrick Height: 195'
Flare Tube: 30" Diam.
Flare Tip: 24" Diam.
Fuel Rate: 265,000 lb/hr
Natural Gas Rate: 3,500 SCFH
Steam Rate: 500-1,000 lb/hr



Separator Drum

Manufacturer: Wyatt Division, U.S. Industri Inc.

Vessel Diameter: 12 ft.
Vessel Length: 35 ft - 9 in. SM-SM

IV. Continued For device shown on block diagram by number 101

2. Capital cost of emission control system.

(a) Capital cost

Major equipment cost $ 193,000

Total installed cost $ 299,000

Year	Cost
1971	$299,000

IV. Continued For device shown on block diagram by number 101.

Yes	No	
X		Was outside engineering contractor used?
X		Was cost included in capital cost?
X		Was in-house engineering used?
X		Was cost included in capital cost?
X		Was emission control equipment installed and constructed at the time plant (process) was constructed?

3. Operating costs of control system.

Give 1972 dollar values per year at capacity given in I.1.

(a)	Utilities	$ 14,500
(b)	Chemicals	-
(c)	Labor	-
(d)	Maintenance (labor & materials)	6,000
(e)	Water treatment (cost of treating any waste water produced by this control system)	-
(f)	Solids remmoval (cost of removing any waste solids produced by this control system)	-
(g)	Other disposal	-
(h)	By-product or product recovery CREDIT	(123,000)
	Total operating credit	$ 102,500

Questionnaire

Air Pollution Control Engineering and Cost Study of the Petrochemical Industry

Please read instructions before completing questionnaire.

Subject chemical: High Density Poly-ethylene

Principal by-products: --

Parent corporation name: Celanese Corporation

Subsidiary name: Celanese Plastics Company

Mailing address: P. O. Box 1000
Deer Park, Texas 77536

Plant name: Celanese Plastics Company, Deer Park Plant

Physical location: Battleground Road, 2 miles N.E. of Deer Park

(include county and air quality control region) Harris County, Region VII

Person EPA should contact regarding information supplied in this questionnaire

Name: A. A. Aikey

Title: Environmental Engineer

Mailing address: P. O. Box 1000
Deer Park, Texas 77536

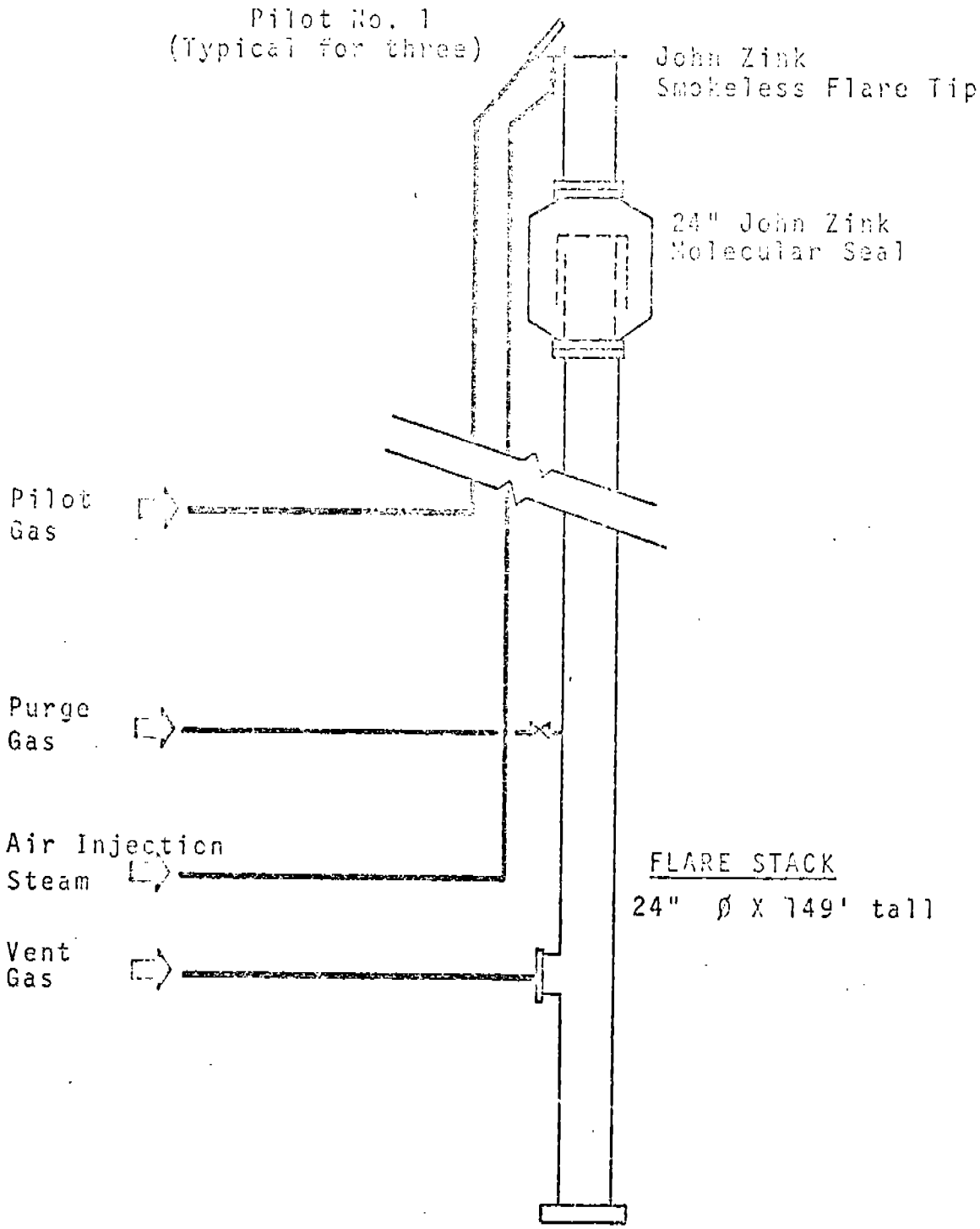
Telephone number: 713 479-2361

Date questionnaire completed: August 18, 1972

IV. Emission Control Device (e)

For device shown on block diagram by number 101.

1. Engineering description



Utilities:

Fuel Gas, Pressure - 15 psig

Steam, pressure - 100 psig, Flow - 2500 lbs/hr.

IV. Continued For device shown on block diagram by number 101 .

2. Capital cost of emission control system.

(a) Capital cost

Major equipment cost	$ 35,000.
Total installed cost	$ 55,000.

Year	Cost
--	--
--	--
--	--

IV. Continued For device shown on block diagram by number 101 .

(b) Check list. Mark whether items listed are included in total cost included in IV.2.a. Do not give dollar value -

Yes	No	Cost	Explanation
X		Site development	
	X	Buildings	
	X	Laboratory equipment	
X		Stack	
X		Rigging etc.	
X		Piping	
X		Insulation	
X		Instruments	
X		Instrument panels	
X		Electrical	
	X	Facilities outside battery limits*	
	X	Storage tanks, spheres drums, bins, silos	
	X	Catalysts	
		Spare parts and non-installed parts	

*Such as - process pipe lines such as steam, condensate, water, gas, fuel, air, fire, instrument and electric lines.

IV. Continued For device shown on block diagram by number 101 .

Yes	No	
X		Was outside engineering contractor used?
X		Was cost included in capital cost?
	X	Was in-house engineering used?
	X	Was cost included in capital cost?
	X	Was emission control equipment installed and constructed at the time plant (process) was constructed?

3. Operating costs of control system.

Give 1972 dollar values per year at capacity given in I.1.

(a)	Utilities	$ 11,000.
(b)	Chemicals	--
(c)	Labor	--
(d)	Maintenance (labor & materials)	300.
(e)	Water treatment (cost of treating any waste water produced by this control system)	--
(f)	Solids removal (cost of removing any waste solids produced by this control system)	--
(g)	Other disposal	--
(h)	By-product or product recovery CREDIT	(--)
	Total operating costs	$ 11,300.

OMB Approval Number 158 S 72019

24-9

Questionnaire

Air Pollution Control Engineering and Cost Study of the Petrochemical Industry

Please read instructions before completing questionnaire.

Subject chemical: High Density Polyethylene

Principal by-products: none

Parent corporation name: Owens-Illinois Inc.&National Distillers & Chemical Corp.

Subsidiary name: National Petro Chemicals Corp. -

Mailing address: P. O. Drawer D

Deer Park, Texas 77536

Plant name: Deer Park Plant

Physical location: Miller Cut-off Road, Deer Park, Texas

(include county and air quaility control region) Harris County; EPA Region VI; Texas Air Control Board Region 7

Person EPA should contact regarding information supplied in this questionnaire

Name: K. G. Carpenter

Title: Plant Manager

Mailing address: U. S. Industrial Chemicals Co.

P. O. Drawer D

Deer Park, Texas 77536 8-713-226-4011

Telephone number: ~~(713) 479-2873~~ (713) 479 2873

Date questionnaire completed: September 18, 1972

3 copies provided this section.

IV. Emission control device

For device shown on block diagram by number 101.

1. Engineering description.

Smokeless Field Flare (see attached drawing)

System has following components:

(1) header of 14" sch 80 pipe with connections to relief valves, etc.

(2) Knock-out Drum - 88" I.D. x 11'-0"

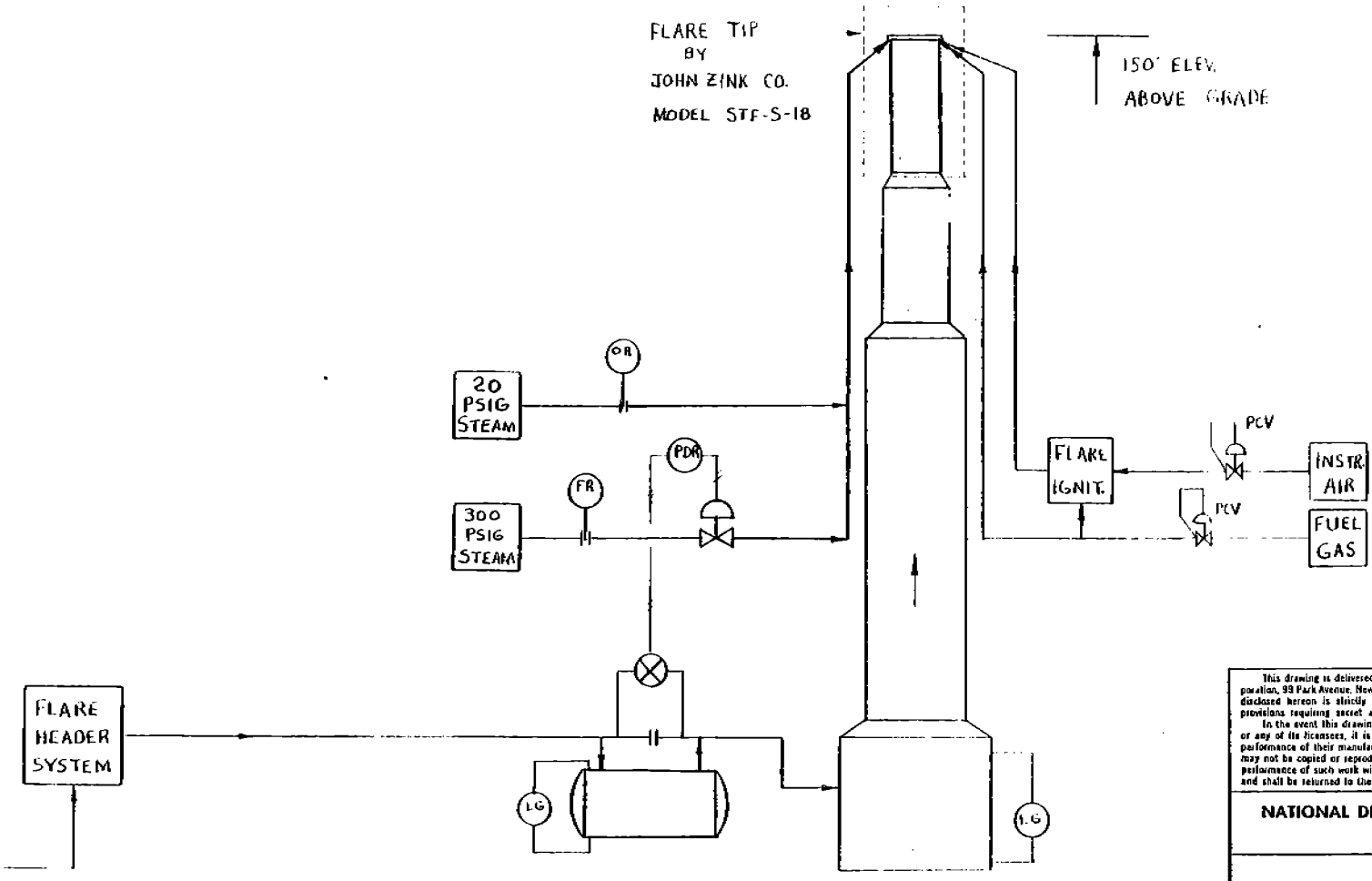
(3) Flare Stack - 150' high with sections 54" I.D., 36" I.D., 24" I.D., and 18" I.D.

(4) Flare Tip - (by John Zink Company)

Model STF-S-18"
Smokeless Flare Rate - 122,900 pounds/hour
715,000 acfh

Remote operating gas-electric ignition system of 3 constant-ignition pilots.

NOTE: Only one device used in plant.



NATIONAL DISTILLERS and CHEMICAL CORPORATION
NEW YORK, N.Y., U.S.A.

SMOKELESS FIELD FLARE (TYPICAL)
H.D.P.E. PLANT HPCC - HOUSTON
EMISSION CONTROL DEVICE 101

DATE 9-14-72	SCALE
DRAWN BY M. RANKIN	CHECKED BY
DEPT. APP'L	ENG. APP'L
LOCATION	DRAWING NO. / ISSUE

NO.	DATE	DESCRIPTION	BY	APPVD
REVISIONS				

IV. Continued For device shown on block diagram by number 101.

2. Capital cost of emission control system.

(a) Capital cost

*Major equipment cost $ 17,100

Total installed cost $ 22,600

Year	Cost	
1962	8,500	
1968	13,100	- increased stack height 50 feet and installed smokeless flare tip.

*Note that cost is not included for flare header system.

IV. Continued For device shown on block diagram by number 101.

(b) Check list. Mark whether items listed are included in total cost included in IV.2.a. Do not give dollar value -

Yes	No	Cost	Explanation
	x	Site development	Part of complete plant installation.
	x	Buildings	
	x	Laboratory equipment	
x		Stack	
	x	Rigging etc.	
x		Piping	
	x	Insulation	
x		Instruments	
x		Instrument panels	
x		Electrical	
	x	Facilities outside battery limits*	Part of complete plant installation
	x	Storage tanks, spheres drums, bins, silos	
	x	Catalysts	
x		Spare parts and non-installed parts	

*Such as - process pipe lines such as steam, condensate, water, gas, fuel, air, fire, instrument and electric lines.

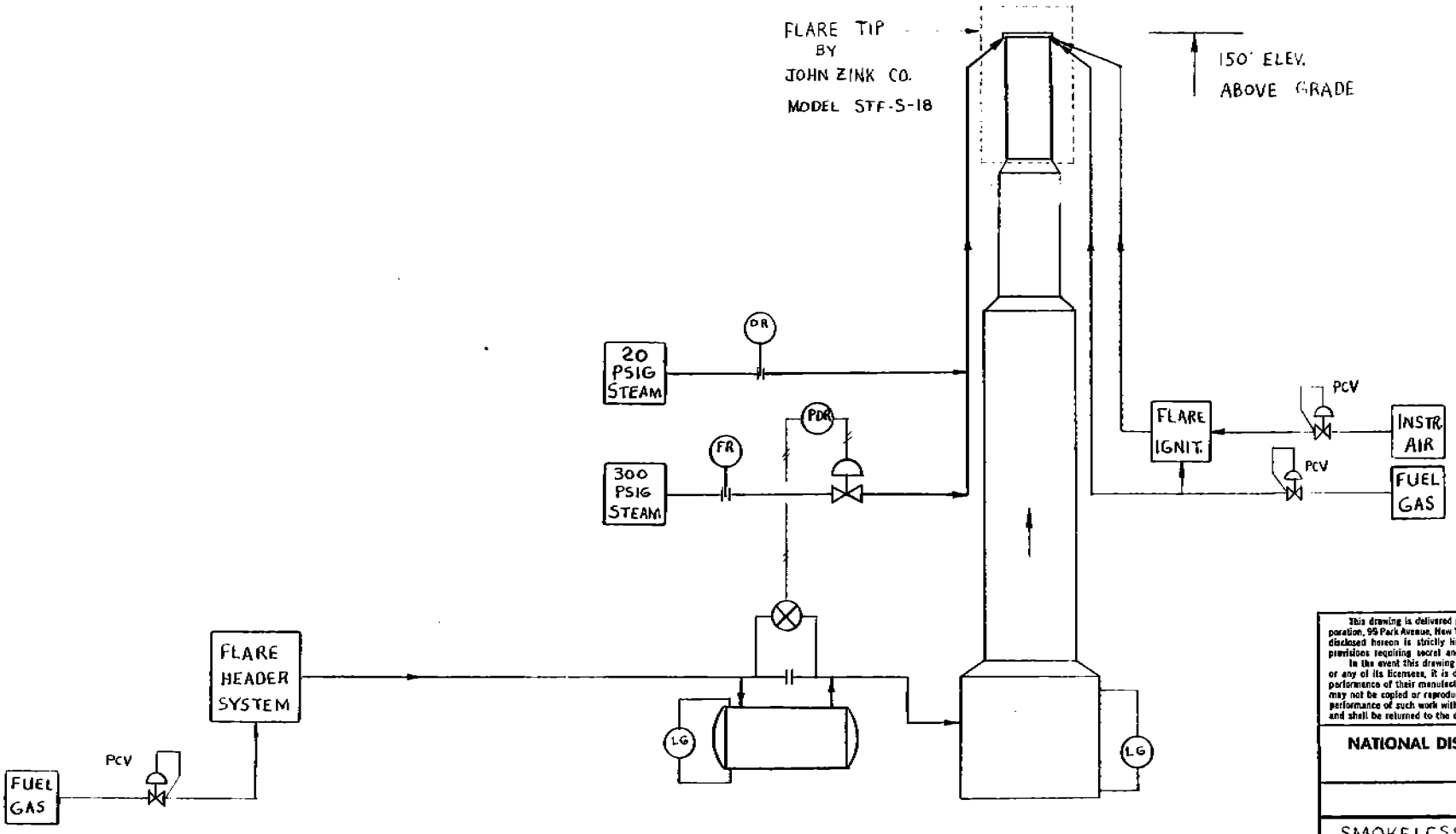
IV. Continued For device shown on block diagram by number 101.

Yes	No	
x		Was outside engineering contractor used?
x		Was cost included in capital cost?
	x	Was in-house engineering used?
	x	Was cost included in capital cost?
x		Was emission control equipment installed and constructed at the time plant (process) was constructed?

3. Operating costs of control system.

Give 1972 dollar values per year at capacity given in I.1.

(a)	Utilities	$11,250
(b)	Chemicals	0
(c)	Labor	0
(d)	Maintenance (labor & materials)	1,000
(e)	Water treatment (cost of treating any waste water produced by this control system)	0
(f)	Solids remmoval (cost of removing any waste solids produced by this control system)	0
(g)	Other disposal	0
(h)	By-product or product recovery CREDIT	(0)
	Total operating costs	$12,250



NATIONAL DISTILLERS and CHEMICAL CORPORATION
NEW YORK, N.Y., U.S.A.

SMOKELESS FIELD FLARE (TYPICAL)

H.D.P.E. PLANT - NPCC - HOUSTON

EMISSION CONTROL DEVICE 101

DATE 9-14-72	SCALE
DRAWN BY M. RANKIN	CHECKED BY
DEPT. APP'L	ENG. APP'L
LOCATION	DRAWING NO. / ISSUE

NO.	DATE	DESCRIPTION	BY	APPVD

REVISIONS

OMB Approval Number 158 S 72019

24 - 12

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AUG 1 1972

Chemplex Company

Questionnaire

Air Pollution Control Engineering and Cost Study of the Petrochemical Industry

Please read instructions before completing questionnaire.

Subject chemical: Low Density Polyethylene

Principal by-products: Polyethylene Waxes

Parent corporation name: American Can and Skelly Oil

Subsidiary name: Chemplex Company

Mailing address: Chemplex Company
P. O. Box 819
Clinton, Iowa 52732

Plant name: Clinton Works

Physical location: U.S. Hwy 30 - 4 miles west of Clinton, Iowa

(include county and air quaility control region) Clinton, Iowa - EPA Region VII

Person EPA should contact regarding information supplied in this questionnaire

Name: Thomas L. Gallaher

Title: Assistant to Production Superintendent

Mailing address: Chemplex Company
P. O. Box 819
Clinton, Iowa 52732

Telephone number: 319-243-5500

Date questionnaire completed: September 13, 1972

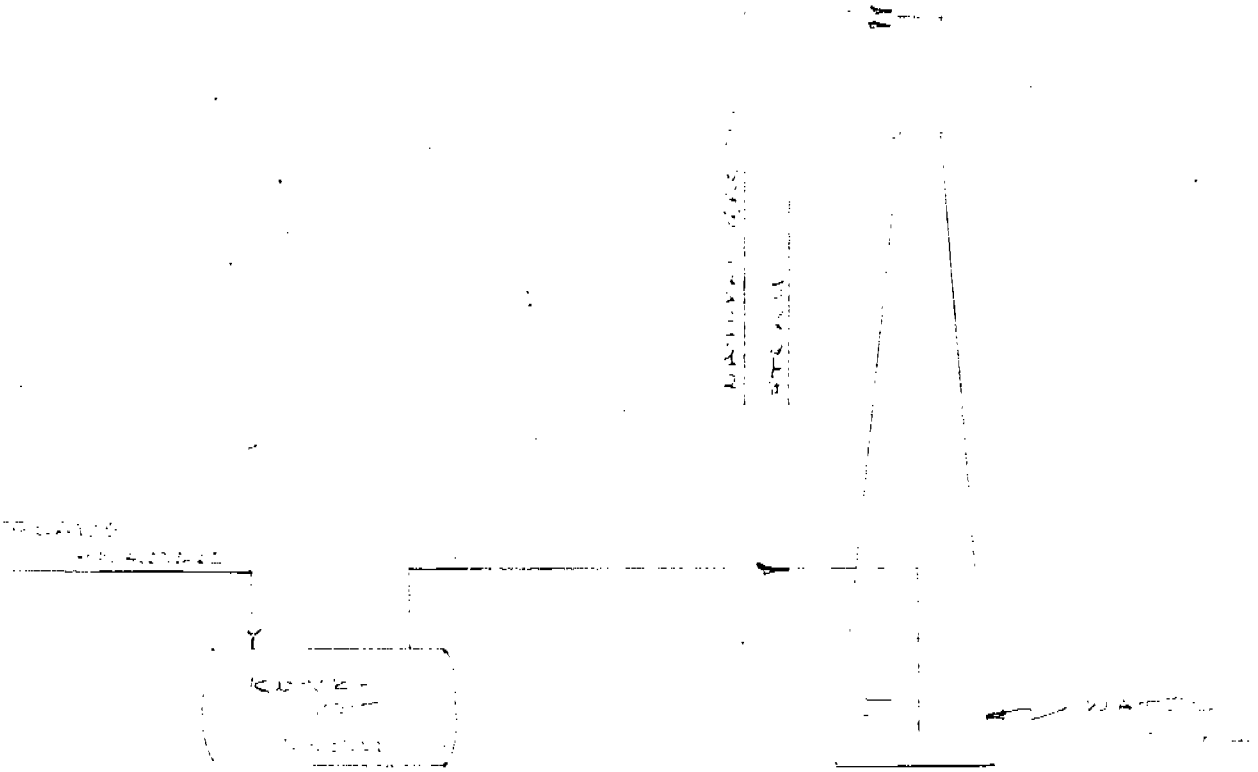
3 copies provided this section.

IV. Emission control device

For device shown on block diagram by number 102.

1. Engineering description.

Stack fabricated by Minneapolis Tank and Manufacturing Company.
Flare Tip - John Zink
No STF-S-36.
Flare Height - 209'
Diameter - 3' at tip, tapering in steps to 14' at base.



Utilities - Steam to flare tip - approximately 3000 lb/hr.
Natural gas to pilot - not known - very small quantity

IV. Continued For device shown on block diagram by number 102.

2. Capital cost of emission control system.*

(a) Capital cost

Major equipment cost	$ 54,000
Total installed cost	$ 520,000

Year	Cost
1967-68	$ 490,000
1969	30,000
TOTAL	$ 520,000

*Costs are for entire flare system which is common to all process units in plant. No attempt made to pro-rate a portion to Low Density Polyethylene.

IV. Continued For device shown on block diagram by number 102 .

(b) Check list. Mark whether items listed are included in total cost included in IV.2.a. Do not give dollar value -

Yes	No	Cost	Explanation
X		Site development	
	X	Buildings	
	X	Laboratory equipment	
X		Stack	
X		Rigging etc.	
X		Piping	
X		Insulation	
X		Instruments	
	X	Instrument panels	
X		Electrical	
X		Facilities outside battery limits*	
X		Storage tanks, spheres drums, bins, silos	
	X	Catalysts	
	X	Spare parts and non-installed parts	

*Such as - process pipe lines such as steam, condensate, water, gas, fuel, air, fire, instrument and electric lines.

IV. Continued For device shown on block diagram by number 102 .

Yes	No	
X		Was outside engineering contractor used?
X		Was cost included in capital cost?
X		Was in-house engineering used?
X		Was cost included in capital cost?
X		Was emission control equipment installed and constructed at the time plant (process) was constructed?

3. Operating costs of control system. *

Give 1972 dollar values per year at capacity given in I.1.

(a)	Utilities	$ 15,000
(b)	Chemicals	---
(c)	Labor	Very Slight
(d)	Maintenance (labor & materials)	Estimated $1000 During Turnaround
(e)	Water treatment (cost of treating any waste water produced by this control system)	---
(f)	Solids remmoval (cost of removing any waste solids produced by this control system)	---
(g)	Other disposal	---
(h)	By-product or product recovery CREDIT	(---)
	Total operating costs Estimated...	$ 16,000

* Costs are for flare which is common to all process units in plant. No attempt made to pro-rate a portion to Low Density Polyethylene.

OMB Approval Number 158 S 72019

24-3

Questionnaire

Air Pollution Control Engineering and Cost Study of the Petrochemical Industry

Please read instructions before completing questionnaire.

Subject chemical: Low Density Polyethylene

Principal by-products: None

Parent corporation name: Sinclair-Koppers Company

Subsidiary name: None

Mailing address: Sinclair-Koppers Company
Koppers Building
Pittsburgh, Pennsylvania 15219

Plant name: Port Arthur Plant

Physical location: Port Arthur, Tex as

(include county and air quaility control region) Jefferson County; Southeast Texas-Southwest Louisiana (Region X).

Person EPA should contact regarding information supplied in this questionnaire

Name: Melvin E. King

Title: Plant Manager

Mailing address: Sinclair-Koppers Company
P. O. Box 848
Port Arthur, Texas 77640

Telephone number: (713) 983-2761

Date questionnaire completed: 9-5-72

3 copies provided this section.

IV. Emission control device

For device shown on block diagram by number 101 .

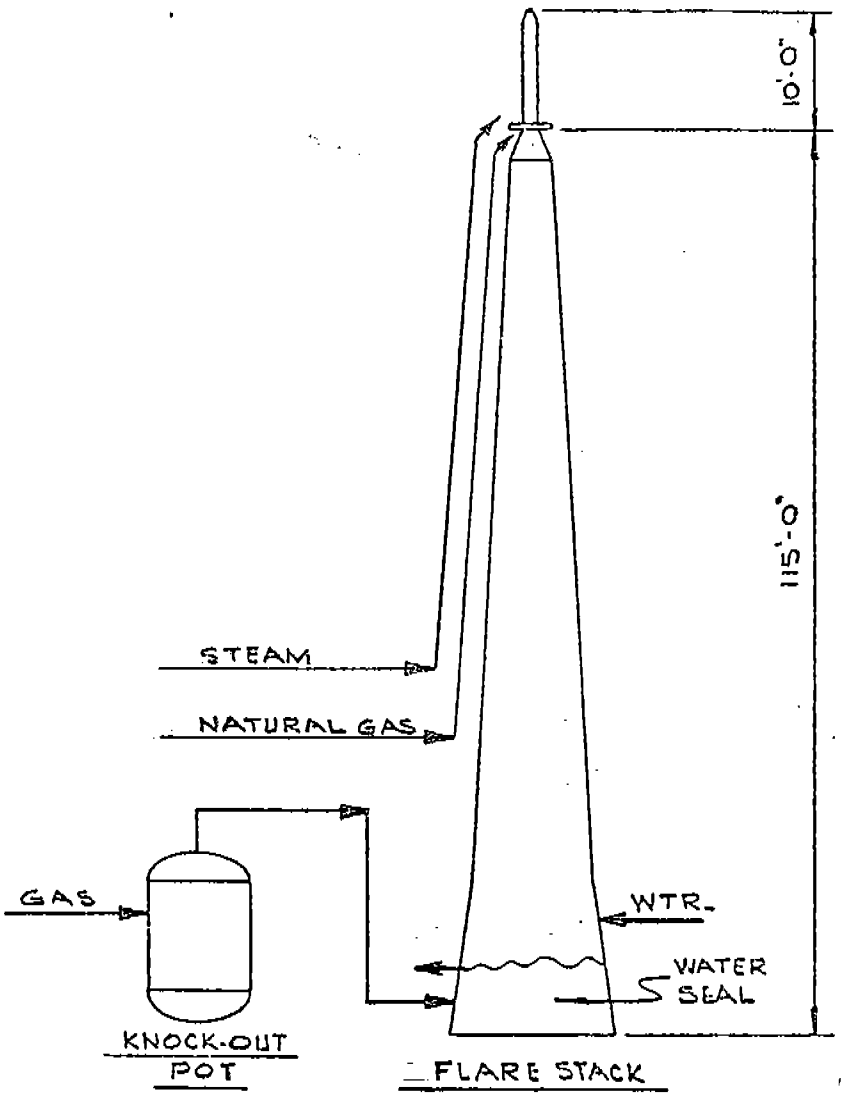
1. Engineering description.

Flare stack with John Zink ignitor system and John Zink smokeless steam ring

Stack diameter tapers from 6'-0" at base to 0'-10" at top.

Gas Rate: 14,000 PPH (Design) Steam Rate: 3500 PPH (Maximum)

Inlet Temperature: Ambient Pressure: 16 inch W.C.



IV. Continued For device shown on block diagram by number 101.

2. Capital cost of emission control system.

(a) Capital cost

Major equipment cost	$ 26,500
Total installed cost	$ 83,000

Year	Cost
1967	76,000
1970	7,000

IV. Continued For device shown on block diagram by number 101 .

(b) Check list. Mark whether items listed are included in total cost included in IV.2.a. Do not give dollar value -

Yes	No	Cost	Explanation
X		Site development	
	X	Buildings	
	X	Laboratory equipment	
X		Stack	
X		Rigging etc.	
X		Piping	
X		Insulation	
X		Instruments	
X		Instrument panels	
X		Electrical	
	X	Facilities outside battery limits*	
	X	Storage tanks, spheres drums, bins, silos	
	X	Catalysts	
	X	Spare parts and non-installed parts	

*Such as - process pipe lines such as steam, condensate, water, gas, fuel, air, fire, instrument and electric lines.

IV. Continued For device shown on block diagram by number 101 .

Yes	No	
X		Was outside engineering contractor used?
X		Was cost included in capital cost?
X		Was in-house engineering used?
	X	Was cost included in capital cost?
X		Was emission control equipment installed and constructed at the time plant (process) was constructed?

3. Operating costs of control system.

Give 1972 dollar values per year at capacity given in I.1.

(a)	Utilities	$8150
(b)	Chemicals	-
(c)	Labor (No additional operators)	-
(d)	Maintenance (labor & materials)	1250
(e)	Water treatment (cost of treating any waste water produced by this control system)	-
(f)	Solids remmoval (cost of removing any waste solids produced by this control system)	-
(g)	Other disposal	-
(h)	By-product or product recovery CREDIT	(-)
	Total operating costs	$ 9400

Flare wg

PLANT SURVEY QUESTIONNAIRE

Polymer Name: Polypropylene

Parent Corporation Name: ABC Industries Inc.

Subsidiary Name: ABC Polymers Co.

Mailing Address: P.O. Box 554

Odessa, Texas

79799

Plant Name: Odessa plant

Physical Location: South Grand Avenue, 1 mile south of I-20

(including county and air quality control region.) Ector County: Texas Region 6

Person EPA should contact regarding information supplied in this questionnaire.

Name: H.E. Smith

Title: General Work Manager

Mailing Address: P.O. Box 554

Odessa, Texas

79799

Telephone Number: (915) 471-4966

Date Questionnaire Completed: September 15, 1980

I. Capacity

1. Process capacity (not production rate)

125 million lbs per year

15,625 lbs per hour

2. Seasonal variation (of production)

Quarter	1	2	3	4	year total
Percent	25	25	25	25	100%

II. Process

1. Process Name and Type:

Ziegler-Natta Polymerization-continuous slurry process

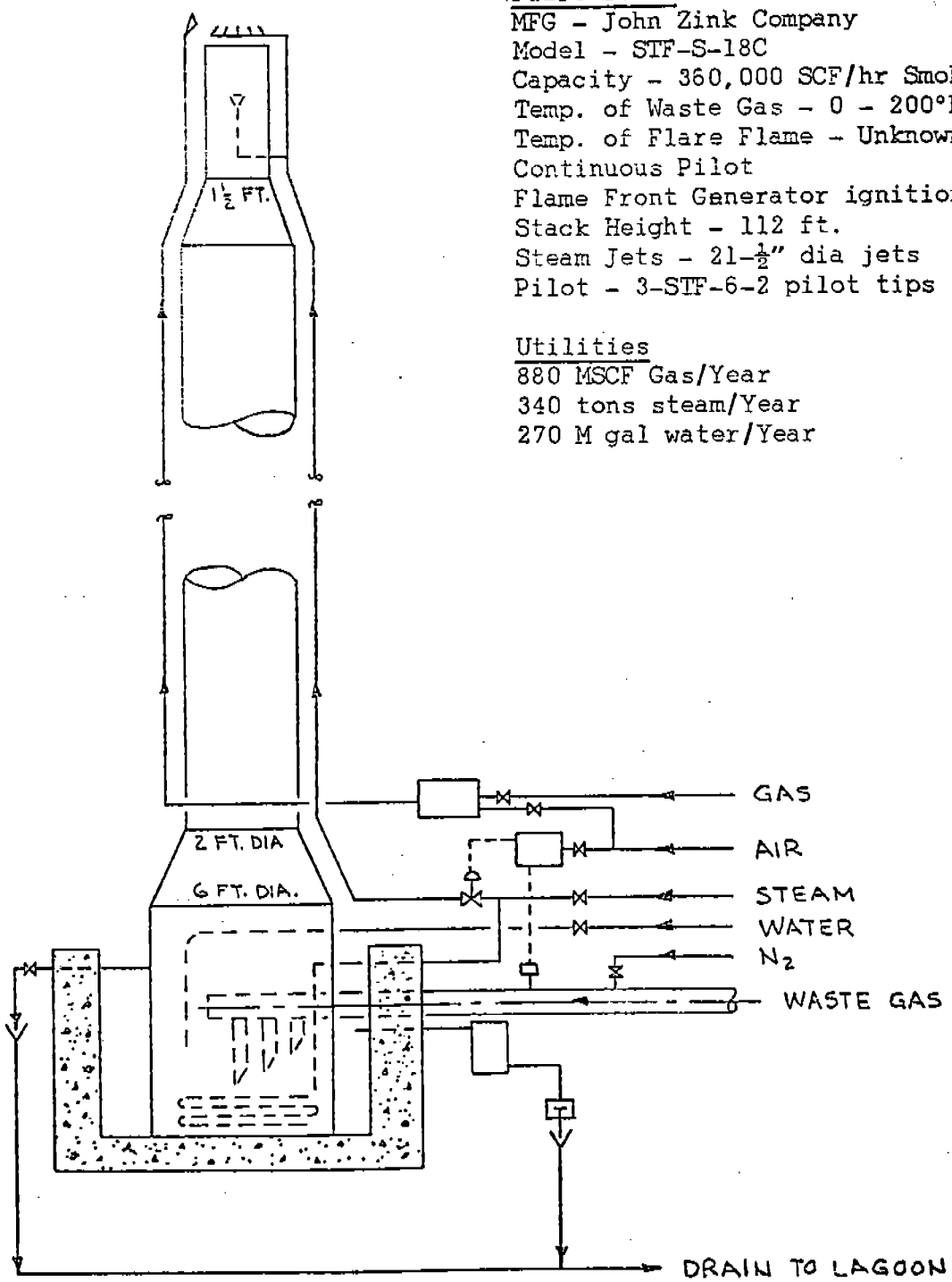
2. Flow Sheet: (overall process block diagram)

(SEE ATTACHMENT 'A')

IV. Emission control device

for device shown on block diagram by number 101.
Device name flare.

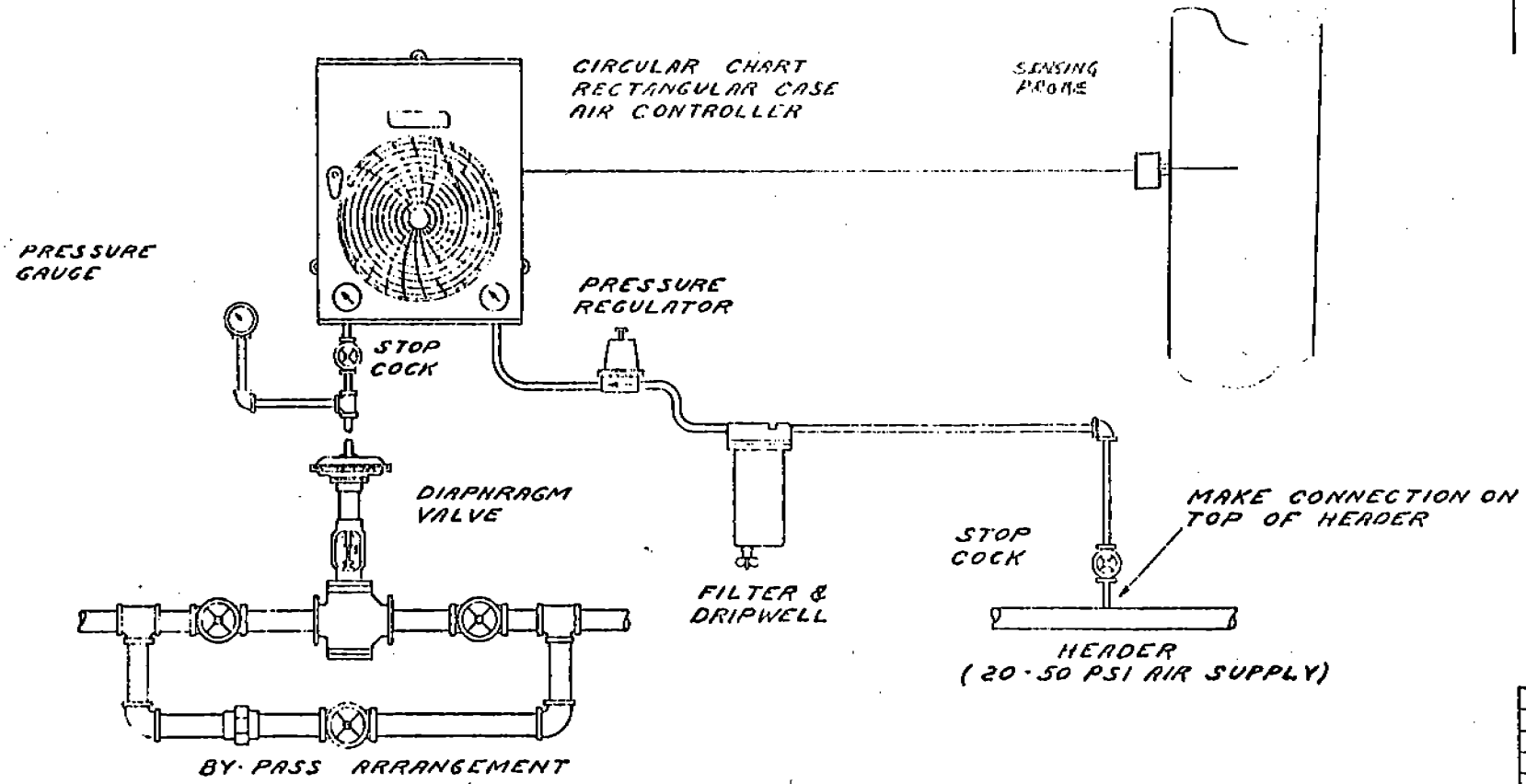
1. Engineering description.



Flare Stack
MFG - John Zink Company
Model - STF-S-18C
Capacity - 360,000 SCF/hr Smokeless
Temp. of Waste Gas - 0 - 200°F
Temp. of Flare Flame - Unknown
Continuous Pilot
Flame Front Generator ignition for pilot
Stack Height - 112 ft.
Steam Jets - 21-½" dia jets
Pilot - 3-STF-6-2 pilot tips

Utilities
880 MSCF Gas/Year
340 tons steam/Year
270 M gal water/Year

DR 296-6	
1 9-2-47	CJ



CONTROL SYSTEM PIPING

USED ON	DRAWN BY

THE BROWN INSTRUMENT CO.
PHILADELPHIA, PA., U. S. A.

CONTROL SYSTEM
PIPING

DESIGN	ENGINEER	APPROVED	DRAWING NO
HWM		E.T.	13-G-37
SCALE		DATE	
		9-2-47	

IV. (continued)

For device shown on block diagram by number 101.
Device name Flare.

2. Capital Cost of Emission Control System:

a) Capital Cost

Major equipment cost: $ 22,386.00 each

Total installed cost: $ 96,416.00 each

Year:	Cost:
1961	$96,416.00

IV. (continued)

For device shown on block diagram by number 101 .

b) Check List. Mark whether items listed are included in total cost included in IV.2.a Do not give dollar value -

Yes	No	Cost	Explanation
X		Site development	
	X	Buildings	
	X	Laboratory equipment	
X		Stack	
X		Rigging etc.	
X		Piping	
X		Insulation	
X		Instruments	
X		Instrument panels	
x		Electrical	
X		Facilities outside battery limits*	
	X	Storage tanks, spheres drums, bins, silos	
	X	Catalyst	
	X	Spare parts and non-installed parts	

*Such as - process pipe lines such as steam, condensate, water, gas, fuel, air, fire, instrument and electric lines.

IV. (continued)

For device shown on block diagram by number 101.

Yes	No	
X		Was outside engineering contractor used?
	X	Was cost included in capital cost?
	X	Was in-house engineering used?
	X	Was cost included in capital cost?
X		Was emission control equipment installed and constructed at the time plant (process) was constructed?

5. Operating Costs of Control System

Give 1980 dollar values per year at capacity give in I.1.

(a) Utilities	$ 2,348.00
(b) Chemicals	---
(c) Labor	1,270.00
(d) Maintenance (labor and materials) (1/2 operations)	2,471.00
(e) Water treatment (cost of treating any waste water produced by this control system)	NONE
(f) Solids removal (cost of removing any waste solids produced by this control system)	NONE
(g) Other disposal	NONE
(h) By-product or product recovery CREDIT	NONE
Total operating costs/Scrubber	$6,089.00
Total for	

Information from confidential files

Flare system

- Used in poly propylene plant
- Avg mol. wt - 40 to 80
- Mfg - National AirOil Burner Co.
- Model - 20" NRC
- Temp. of waste gas - 0-200°F
- Stack ht - 165'
- Utilities - 3.6 MM SCF gas/yr
  1400 ton steam/yr
  1.44 MM gal water/yr

costs - Purchased - $99,385
Total inst - 200,000 in 1978
Operating costs - $28,608/yr of which $19,368 for utilities, $3,080 for maintenance and $6160 for oper. labor

---

UCC LDPE high pressure process

Flare system

5' 2" dia, 250 ft long, air assisted with 4 pilots
Design capacity 2.2×10^6 lb/h
This flow occurs for two seconds during venting. Flow to the flare system is [illegible] from 1.4×10^6 lb/h for only 6 seconds of the blowdown.

UCC LDPE [illegible] process

1) Mfr → Flaregas
capacity - 6,000 lb/h (continuous) continuous
- 30,000 lb/h max.
30 ft tall & 2 pilots

2) Emergency flare
cap. 440,000 lb/h max.
85,000 lb/h cont.
170 ft tall with 3 pilots

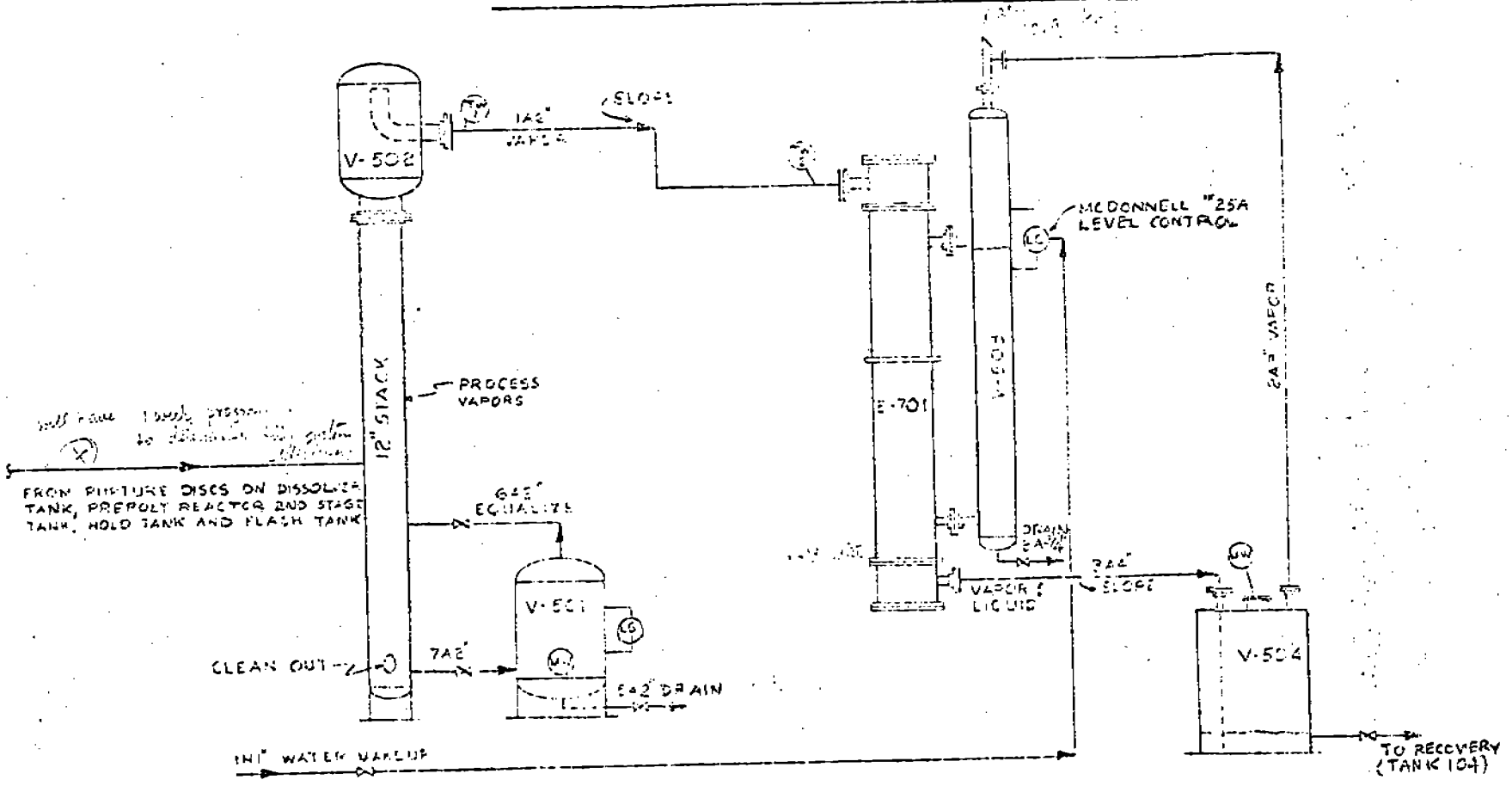
Phillips Petroleum Co. Adams County, Tx
(From Emissions Inventory by TACB)

- Smokeless flare
  Pollutant controlled ~~-tail~~ propylene at 100% eff
  Installed cost $15,170 in 1970
  Gas 9198 MCF/yr
  Steam 29,959 M lbs/yr
  operation 24 hr/7 days/wk & 29 wks/yr
  (Plant was shutdown completely for 13 wks)

- Smokeless flare
  Pollutant controlled - Propane at 100% eff
  Installed cost - $9,500 in 1964
  Gas rate - 4,691 MCF/yr
  Steam 15,279 M lb/yr
  op - 8760 hr/yr

Talk to V.A Bowman, Jr at mobil chem co.
about condenser systems for Polystyrene plants
713-871-5770 or B.A. Larson 713-871-5995

VAPOR CONDENSING/RECOVERY SYSTEM



	V-502	V-501	E-701	V-503	V-504
	SCRUBBER 24"OD x ?'	SURGE TANK 20"OD x 36" MINERAL OIL	HEAT EXCHANGER 21"ID x 20' SHELL 1000 FT²	WATER SURGE TANK 24"OD x 20'	SURGE TANK ?000 GAL (CONDENSATE)

NOTES

REVISIONS	BY	DATE

McEVER ENGINEERING INC HOUSTON TEXAS

MOBIL CHEMICAL COMPANY
POLYSTYRENE OPERATION
SANTA ANA, CALIFORNIA

CONT NO E-5[illegible]
DWG NO MCP-2

REF DWGS

Flare Diameter (in.)	Flare Height (ft)[a] (1)	(2)	(3)	Propylene Flow Rate (lb/hr)	Number of Pilots	Flare Tip & Seal Cost	Auto Ignition Cost	Stack, Piping & Painting Cost	MUS & KO Costs[a]	Erection Costs	Ladder & Platform Costs	Steam Control Costs	Wind Speed & Direction Control Cost	Total Installed Cost	Installed Flare Cost Excluding Ladder & Platform	ELA Values from Figure B-1: Flare Components Cost	Transfer Line Cost	Tota Flar Cost
2	12	40	40	1,400	1	$3,700	$4,400	$3,200	$10,000	$9,000	$4,680	$8,500	$2,800	$46,280	41,600	$41,600	$1,900	$43,50
3	21	40	40	4,205	1	4,300	4,400	3,400	10,000	9,000	4,680	8,500	2,800	47,080	42,400	42,400	3,100	45,50
4	28	40	40	7,476	1	5,500	4,400	3,800	10,000	9,000	4,680	8,500	2,800	48,680	44,000	44,000	4,300	48,30
6	42	45	45	16,820	1	7,800	4,400	4,200	15,500	9,000	4,750	8,700	2,800	57,150	52,400	52,400	7,800	59,40
8	56	60	59	29,903	1	9,300	4,400	4,800	21,000	17,000	5,400	8,700	2,800	73,400	68,000	68,000	12,000	80,00
10	71	75	72	46,724	2	13,500	5,500	7,100	27,000	17,000	6,800	8,700	3,200	88,800	82,000	82,000	17,000	99,00
12	85	95	86	67,283	2	14,300	5,500	10,300	27,000	17,000	8,170	9,500	3,200	94,970	86,800	86,800	28,000	114,80
14	99	105	96	91,579	2	15,500	5,500	13,500	37,000	17,000	8,690	9,500	3,200	109,890	101,200	101,200	39,000	140,20
16	113	120	105	119,613	2	16,500	5,500	17,800	37,000	28,000	10,380	9,500	3,200	127,880	117,500	117,500	48,000	165,50
18	127	130	120	151,388	2	18,000	5,500	22,000	46,000	28,000	11,360	9,500	3,200	143,560	132,200	132,200	54,000	186,20
20	141	145	130	186,896	2	20,000	5,500	26,500	46,000	28,000	12,510	9,500	3,200	151,210	138,700	138,700	58,000	196,70
24	169	175	160	269,130	3	23,800	6,600	39,300	56,000	37,000	13,750	14,500	3,600	194,550	180,800	180,800	95,000	275,80
30	212	220	200	420,516	3	30,200	6,600	60,100	56,000	37,000	16,480	18,000	1,600	227,980	211,500	373,500	130,000	503,50
32	226	235	210	478,453	3	34,500	6,600	67,500	64,000	37,000	17,160	18,000	3,600	248,360	231,200	393,200	160,000	553,20
36	254	265	235	605,543	3	36,300	6,600	85,300	64,000	37,000	19,500	18,000	1,600	270,300	250,800	417,800	180,000	592,80
42	296	305	290	824,211	4	44,000	7,700	117,100	77,000	45,000	22,830	21,000	4,200	338,830	316,000	505,000	230,000	735,00
48	339	350	320	1,076,521	4	67,400	7,700	149,100	77,000	45,000	25,180	21,000	4,200	396,580	371,400	970,000	310,000	1,280,00
54	381	395	360	1,362,471	4	79,800	7,700	190,300	90,000	45,000	28,470	21,000	4,700	466,470	438,000	1,156,200	370,000	1,526,20