

# METHANOL PLANTSHIP

## Appendix

Cost Shared by

TRADE DEVELOPMENT PROGRAM  
of the  
UNITED STATES DEPARTMENT OF STATE  
WASHINGTON, D.C.

And by Co-Sponsors

YANKEE ENERGY CORPORATION  
80 BOYLSTON STREET  
BOSTON, MA 02116

and

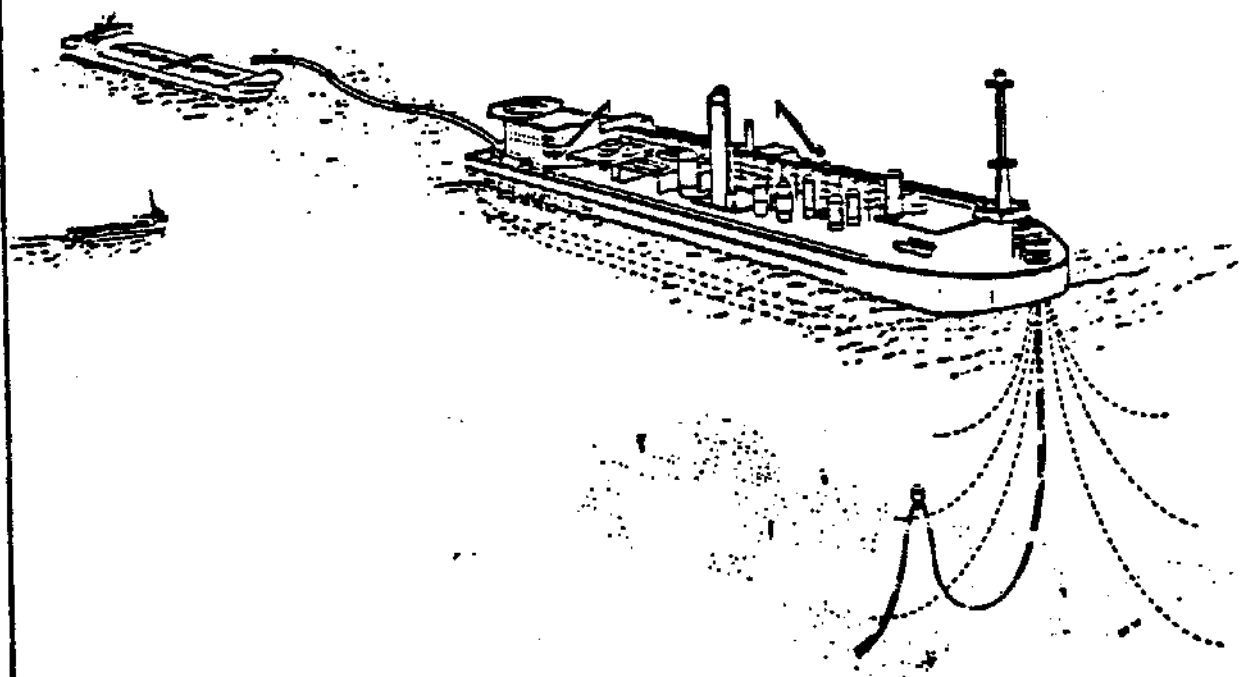
TENNECO OIL COMPANY OF TRINIDAD, INC.  
1100 LOUISIANA STREET  
HOUSTON, TX 77200

Appropriation #72-1171001  
July 30, 1988

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**FRONTISPIECE: FLOATING METHANOL PRODUCTION SYSTEM**

## A. CAPITAL REQUIREMENTS

Two years had passed since the 'generic' design of the plantship had been costed, also, numerous design changes to the plant and improved detailing to field development, the gas delivery and mooring systems had been incorporated in making the plantship site specific; together, these formed the basis for a re-determination of capital required to implement the project. Results of re-determinations are presented in sections to follow. Two major areas of cost consideration are highlighted.

a) the 'most probable' cost for each major system element - the vessel, the process plant, the gas collection/delivery system - was reduced from initial (DOT) estimates, and,

b) the uncertainty as to the accuracy of the 'most probable' cost areas narrowed; costs are now believed known within 15% accuracy, plus or minus.

### **A-1 PLANT VESSEL CAPITAL COST SUMMARY**

These data were obtained by Waller Marine, Inc.; sources where appropriate. were identified.

#### **ELEMENTS/DETAIL OF PLANT VESSEL COST**

Pre-Contract Engineering (+/- 0 percent)	\$450,000
Plan Approvals, Equipment Procurement & Contract Supervision(+15%,-0%)	\$1,400,000
Owner Furnished Items(see Section A-1.1) (+7.5%,-0%)	\$14,321,000
Freight Cost, Owner Furnished Items (+/- 10%)	\$500,000
Vessel Detail (Design, Construction, Outfitting Hyundai (+10,-0%)	\$54,370,000
Builder's/Construction Insurance (+/-10%)	\$500,000
Survey/Inspection Services (for Underwriters and Classification Society)(+/-30%)	\$1,500,000
Major Pressure Vessels	500,000
Piping and Valves,Etc.	500,000
Vessel; Mat'ls & Wkmnsp	500,000
Internal Structure, Mooring Turret (+/-7.5%)	\$3,000,000
Single Point Mooring (design, pressure, install, hook-up; midpoint of SOFEC and IMODCO estimates) (+/- 10%)	\$17,264,000
Vessel Towing and Tow Insurance (Smith and Goliath)	\$5,825,000
From Korea: \$1,400,000 + \$3,000,000 = \$4,400,000	
From Gulf Coast: \$300,000 + \$1,125,000 = \$1,425,000	

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'Most Probable' Cost	\$98,900,000
Accuracy Estimate, % +10.7; -3.9	
Estimated Cost Range: \$95,043,000 to \$109,482,000)	

#### **A-1.1 VESSEL CONSTRUCTION COST BASIS AND QUOTATIONS**

On the following pages are presented the Waller Marine request of Hyundai and the Hyundai response to Waller Marine. This section presents the very thorough basis upon which Hyundai Corporation was enabled to prepare its quotation for the detailed design, manufacture and partial outfitting of the vessel; the Hyundai quotation is also presented.



Waller Marine, Inc.  
1400 Broadfield, Suite 650  
Houston, TX 77084  
713/872-0245  
Telex 792-389

December 30, 1987

Mr. Joo Hyun Nam  
Hyundai Corporation  
1400 Broadfield, Suite 650  
Houston, Texas 77084

Subject: Floating Methanol Plant Vessel  
For Yankee Energy

Gentlemen:

The drawings, specifications and instructions provided herewith are forwarded for the purpose of soliciting a budgetary price for the construction of a barge hull and associated equipment that is designed to support a 3000 tons per day methanol plant.

It is proposed by the Owner, Yankee Energy of Boston, that the vessel, as specified, complete with certain owner furnished equipment, be constructed in Korea and then towed to a U.S. Gulf coast port, where the methanol plant will be installed and tested.

The specification, as written, was produced for a dual purpose - to provide the basis for the detail design of the plant vessel and to provide the conditions for construction. There have been a few changes, since the specification was produced, which are enumerated herewith: -

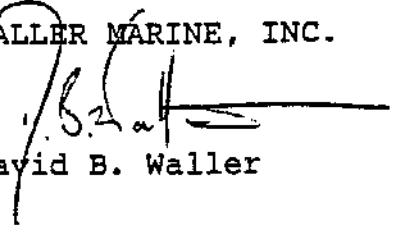
- a. The vessel will be constructed complete with Owner furnished equipment, hull and cargo piping systems, electrical power generation and distribution systems, accommodation with complete outfit and deck machinery. The vessel will be delivered without the methanol plant and its associated piping systems and without the turret mooring system.
- b. The vessel will not be U.S. Coast Guard approved not constructed to U.S. Coast Guard survey. The intent however, will be to construct the vessel in accordance with current U.S. Coast Guard regulations.
- c. Description of the methanol plant indicates that a 37.5 megawatt gas turbine will be installed in the U.S. This will be eliminated and replaced by additional diesel/electrical generation (as shown in the drawings) and a steam boiler.

- d. The drawing list is replaced by the separate list forwarded herewith, together with a list of Owner furnished equipment. Such equipment would be delivered to the yard, free and clear, for installation and hook-up by the yard.

Should you have any questions concerning the package, please feel free to call Mr. Phil Guy or myself.

Sincerely,

WALLER MARINE, INC.



David B. Waller

DBW/sd

Enclosure

YANKEE ENERGY - METHANOL BARGE

OWNER FURNISHED EQUIPMENT

	<u>DWG NO.</u>
<u>MAIN DIESEL GENERATORS</u> - 3 Mirrlees Blackstone KVP 12 w/associated equipment Listed in Manufacturers quotation Included in Bid Package	D292-G13
<u>SWITCHBOARDS &amp; MOTOR CONTROL CENTERS</u>	D292-M-02
<u>BOW THRUSTERS &amp; MOTORS</u>	D292-P-05
<u>PRIMARY PLANT COOLING WATER SYSTEM</u>	SH 1 & 2 SH 1 & 2 SH 1 & 2 SH 1 & 2
Plate Coolers - 10 Alpha Laval Model AX30B	
Strainers - 4	
S. W. Pumps - 12	
Cooling Water Pumps - 2	
<u>PRODUCT DISCHARGE SYSTEM</u>	D292-P-02 SH 1 & 2
Pumps - 12 Framo Cargo SPS 12 methanol Pumps	
<u>BILGE &amp; BALLAST SYSTEM</u>	D292-P-03
Pumps - 7 Framo Reversible Ballast Pumps RBP-2-300	
<u>F. W. (POTABLE) SYSTEM</u>	D292-P-07
Pressure Sets - 2	
Hot Water Heaters - 3	
Hot Water Circ Pump - 1	
<u>MAKE-UP (PROCESS) WATER</u>	D292-P-08 D292-M-01
Desalination Units - 3 (Vacuum Still) 30,000 GPM	
Desalination Unit - 1 (Reverse Osmosis)	
F. W. Pumps - 3 (70 GPM, 5 PSI, 60 BHP)	
<u>HYDRAULIC SYSTEM</u>	D292-P-10
Power Pack Skid - 1 Framo Supply	
Control Panel - 1 Framo Supply	
Oil Filter & Cooler - 1 Framo Supply	
Hydraulic Oil tank - 1 Framo Supply	



D292-P-9

DIESEL OIL SYSTEM

Diesel Oil Transf Pumps - 2  
Diesel Oil Purifier - 1  
Lube Oil Pump - 1  
Dirty Oil Pump - 1  
Oily Water Separator - 1

D292-P-11

FIRE MAIN & CO2 SYSTEM

Fire Pumps - Elec. Mtr Drive - 2  
Emergency Fire Pump w/Diesel Drive - 1

D292-P-12

SEWAGE SYSTEM

Sewage Treatment Plant - 1

SH 3

D292-P-13

DIRTY OIL & L. O. SYSTEM

Dirty Oil Pump - 1  
L. O. Pump - 1

D292-P-14

HYDROCARBON & CONSENSATE DRAIN SYSTEM

Oily Water Pump - 1 Deep Well

D292-P-16

COMPRESSED AIR SYSTEM

Instrument Air compressor Unit - 1  
Cold Start Compressor - 1  
Instrument Air Receiver - 1  
Instrument Air Dryer - 1

D292-M-01

PRODUCT TANK INERT GAS SYSTEM

Inert Gas Generator - 1  
Nitrotech Model 14995

D292-P-15

D292-M-01

D292-M-04

HULL VENTILATION SYSTEM

All Vane Axial Fans - 25 (See Fan List)

EMERGENCY MOORING GEAR

Moorfast Anchors 30,000# - 2  
Chain Leaders - 2  
2 3/4" Wire Rope - 3000 Ft - 2  
Single Drum Winches - 2

LIFESAVING EQUIPMENT

Life Boats, Life Rafts, Preservers & Rings

YANKEE ENERGY - METHANOL BARGE

DRAWING LIST

<u>DRAWING NO.</u>	<u>NO. SHTS</u>	<u>TITLE</u>	<u>REV</u>
D-292-G-01	1	Outboard Profile	2
D-292-G-02	1	Main Deck Arrangement	3
D-292-G-03	1	Inboard Profile	3
D-292-G-04	1	Transverse Sections	1
D-292-G-05	1	Lines	0
D-292-G-07	2	Compartment & Access Plan	0
D-292-G-10	1	Quarters Arrangement Main Deck and 1st level	0
D-292-G-11	1	Quarters Arrangement 2nd and 3rd level	0
D-292-G-12	1	Quarters Arrangement 4th level	0
D-292-G-13	1	Workshop Arrangement	1
D-292-G-18	1	Firezone Subdivision Plan	0
D-292-G-19	1	Arrangement-Life Saving Equipt	0
D-292-H-01	1	Midbody Structural Sections	0
D-292-H-02	1	Side Shell Structure	0
D-292-H-03	1	Bottom Shell Structure	1
D-292-H-04	1	Deck Structures	1
D-292-H-05	1	Longitudinal Bulkheads & Framing	1
D-292-H-06	1	Deck House Structure	0
D-292-H-07	1	Quarters Longitudinal Section	0
D-292-M-01	1 of 2	Machinery Arrgt Port Side	1
D-292-M-01	2 of 2	Machinery Arrgt Stbd Side	0
D-292-M-02	1	Thruster and Aft Machinery Arrangement	0
D-292-M-03	1	Forward Vessel Machinery Arrangement	0
D-292-M-04	1	Hull Ventilation System Schematic	1
D-292-P-02	2	Product Discharge Piping Arrgt	0
D-292-P-03	1	Bilge & Ballast System Schematic	0
D-292-P-05	1	Primary Plant Cooling Water System Diagram	1
D-292-P-07	4	Fresh Water (Potable) System Schematic	0
D-292-P-08	1	Make-Up (Process) Water System Schematic	0
D-292-P-09	1	Diesel Oil System Schematic	0
D-292-P-10	1	Hydraulic System Schematic	0

# DRAWING LIST

<u>DRAWING NO.</u>	<u>NO. SHTS</u>	<u>TITLE</u>	<u>REV</u>
D-292-P-11	1	Fire Main of CO2 Schematic	1
D-292-P-12	4	Sewage System Schematic	0
D-292-P-13	1	Dirty Oil & Lube Oil Piping Diagram	0
D-292-P-14	1	Hydrocarbon Condensate & Drain System Schematic	0
D-292-P-15	1	Product Tank Inert Gas Schematic	0
D-292-E-01	1	Electrical System Block Diagram	1
D-292-E-02	1	Electrical One-Line Diagram	1

YANKEE ENERGY - METHANOL BARGE

SYSTEMS TO BE PARTIALLY INSTALLED

1. D-292-P-05 SH 1 & 2  
PRIMARY PLANT COOLING WATER SYSTEM

System to be completely installed in the port lower machinery space & carried through the main deck & capped off at that point.

2. D-292-P-02 SH 1  
PRODUCT DISCHARGE PIPING

System to be completely installed in the vessels body but capped off at the transom. To be completed when hose reel assembly installed in U.S.

3. D-292-P-11  
FIRE MAIN & CO2 SYSTEM

System to be installed below decks, forward & aft, throughout the accommodations & workshop areas but capped off in way of main deck. To be completed after plant has been installed in U.S.

4. D-292-P-14  
HYDROCARBON CONDENSATE & DRAIN SYSTEM

System to be capped off from the oil pump discharge. System to be completed after flare is installed in U.S.

5. D-292-P-16  
COMPRESSED AIR PIPING

System to be completed below deck & into workshop. System to be capped off at the main deck penetration. System to be completed after plant installation in U.S.

6. D-292-P-08  
MAKE-UP PROCESS WATER SYSTEM

Desalination units to be installed. S.W. & F.W. lines connected complete through lower hull deckhouse & workshop. All lines to plant capped off at main deck. System to be completed together with steam supply in U.S.

7. D-292-P-15  
PRODUCT TANK INERT GAS SYSTEM

Cap off piping leading to flare & condensate storage tank.

**OWNER'S FURNISHED EQUIPMENT**

	<b><u>UNIT COST</u></b>	<b><u>TOTAL COST</u></b>
Mirrlees Diesel: Diesel Generators, 5000 KW-(3)	\$2,537,500	\$7,612,500
Fromo Cargo Pumps	—	\$1,500,000
Tank Gaging & Control Console	—	\$170,000
Fromo Bilge & Ballast Pumps	—	—
Alfa -Laval Plat Heat Exchangers-(10)	\$105,000	\$1,050,000
D.O. Transfer Roper Model 26F150-17-(5)	\$3,678	\$18,390
Plant Cooling System S.W. Pump Goulds V.I.T. 30 BLC/1 w/Driver-(12)	\$60,789	\$729,468
L.O. Sump, Reduction Gear, L.O. Pump Roper Model 2 AM 16-(4)	\$659	\$2,636
Coflexip 2-10" Methonal Lines 700'-(2)	\$340,000	\$680,000
Nitcotec P.S.A. Nitrogen Generating System Model 14995-(1)	\$380,000	\$380,000
Shat Davit Corp: (1) Shipset of Life Boats & Davits (4) Lifeboats w/Davits	— —	— \$592,000
Hartzell Fans w/Mufflers & American Warming & Ventilating, Inc 4-way Diffuses for Hull Ventilating System	— —	— \$510,089
Texas Fire & Safety Fire Protection Equipment	—	\$141,644
Distilling Units-(3)		
Aqua-Chem Inc. Model S2083FL3-50,000 gal/per day	\$179,330	\$537,990
A.B. Curl & Assoc. Inc. Anderson Industrial Products Industrial Air Dryers-(1)	\$13,600	\$13,600
Ingersoll-Rand Ingersoll-Rand Two Stage, Non-Lubricated Reciprocating Compressor 500 aefm at 125psig	\$68,206	\$68,206
E.M. Chekan 30" Kinney Model A Motorized Automatic Self Cleaning Spainers 5 hp Motor-(4)	\$77,150	\$308,600
		<b>TOTAL \$14,321,125</b>