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EVALUATION OF TARGET OIL IN THE 50 MAJOR OILFIELDS OF THE PERMIAN BASIN FOR ENHANCED OIL RECOVERY

By

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TECHNICAL INFORMATION CENTER
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U.S. DEPARTMENT OF ENERGY
TECHNICAL INFORMATION CENTER

FOREWORD

The primary purpose of the Department of Energy (DOE) managment plan for enhanced oil recovery (EOR) is to prove and demonstrate the feasibility of new recovery technology. Proven new technology is then transferred to private industry for application to recover more oil.

Knowledge of oil reservoir characteristics is needed so that suitable EOR candidate reservoirs can be selected. The purpose of this project is to develop knowledge of reservoir characteristics such as lithology; types of oils and brines; types of EOR chemicals and/or processes; compatibilities of the EOR chemicals with the indigenous reservoir brines, oils, and rocks; and the probable EOR potential of reservoirs.

This report contains the best information currently available concerning the probable EOR potential of 50 major oilfields in the Permian Basin. As technology develops this potential may increase.

A. Gene Collins
DOE Technical Project Officer

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EVALUATION OF TARGET OIL IN THE 50 MAJOR OIL FIELDS OF THE PERMIAN BASIN FOR ENHANCED OIL RECOVERY

by

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ABSTRACT

This investigation is to determine the target oil available for enhanced oil recovery (EOR)from 50 major producing oilfields in the Permian Basin. Five enhanced oil-recovery methods were considered and a screening process was used to determine which was most suitable for each of the fields. The criteria used in the screening process were published on pages 98, 116, and 144 of the National Petroleum Council's (NPC) 1976 report on Enhanced Oil Recovery (3).

The 50 major Permian Basin fields have an estimated 27.6 billion barrels of oil unrecoverable under present operating conditions. The screening process indicates that none of the fields have an outstanding potential for thermal recovery or surfactant polymer methods. However, 16 fields have carbon dioxide potential and 11 have polymer waterflooding potential. According to the screening process, none of the five methods considered was suitable for the remaining 23 fields.

INTRODUCTION

Domestic oil reserves in the United States have declined for the past several years because not enough new reserves have been found to offset annual withdrawals. Because of the lack of new discoveries and the resultant decrease in reserves, investigations are being made to determine how much target oil is available for EOR methods from known domestic oilfields, and which EOR process would be most suitable.

For this study, 50 of the largest fields in the Permian Basin were selected and a screening process used to determine the most suitable EOR process for each field. The enhanced oil-recovery potential of these fields was not quantified, but the target oil was quantified for each field.

1/ Petroleum engineer.
2/ Supervisory petroleum engineer.

To increase the ultimate recoverable oil, certain enhanced oil recovery processes have been developed in the laboratory and field-tested with varying degrees of success. EOR methods considered in this investigation are: (1) steam drive; (2) in-situ combustion; (3) carbon dioxide miscible flooding; (4) surfactant polymer flooding; and (5) polymer waterflooding.

This study reviews the geological, reservoir, and fluid characteristics of the 50 major fields in the Permian Basin and using selected screening criteria, determines the most suitable EOR method for each field (1, 3-8). Based upon the screening criteria, the data indicate that steam drive, in-situ combustion, and surfactant polymer are not likely to be suitable processes for fields in the Permian Basin.

Similar work evaluating selected fields in the United States for enhanced recovery has been done (2). This report differs in that it is confined to the Permian Basin and contains detailed information for 50 major fields. No attempt has been made to predict increased oil recovery by EOR methods or the economics involved.

This report contains estimates of the original oil-in-place by field; reserves as of December 31, 1976; the ultimate recovery using present technology, and the target oil or the amount of oil that will will be left unrecovered after the present producing process is completed.

METHOD USED TO SELECT THE 50 MAJOR PRODUCING OILFIELDS IN THE PERMIAN BASIN

The 50 major producing oilfields in the Permian Basin are defined as the reservoirs or pools with the largest ultimate recoverable oil as of December 31, 1976. Ultimate recoverable oil and original oil-in-place were estimated by standard engineering methods, using both the volumetric and decline curve analyses. The geographical locations of the 50 fields are shown in figure 1.

Table 1 presents the estimates of original oil-in-place, reserves as of December 31, 1976, ultimate recovery, and target oil for the 50 fields in the Permian Basin. The fields are ranked in order of estimated ultimate recovery.

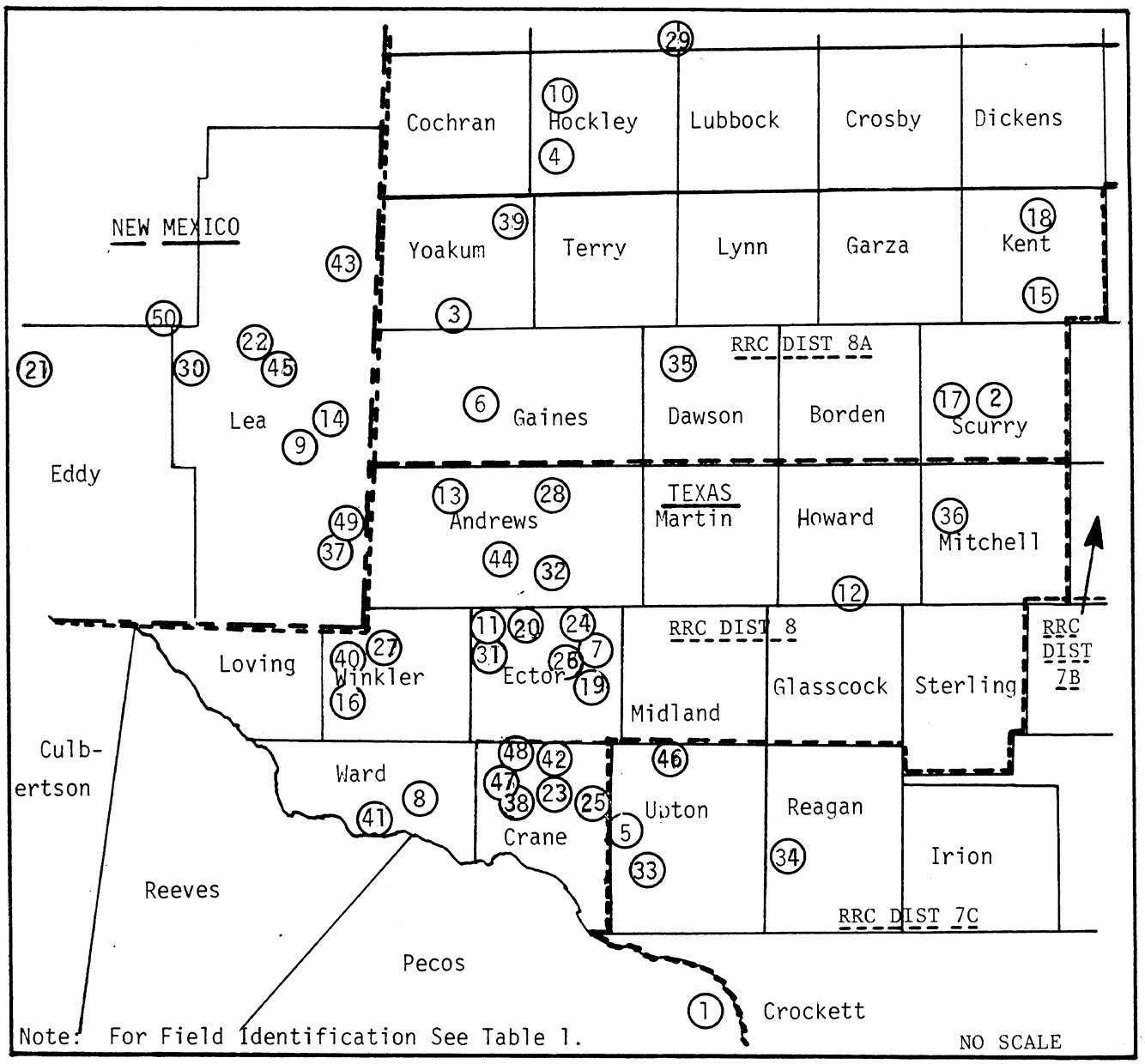

FIGURE 1.—Approximate geographical location of 50 major oil fields in Permian Basin.

TABLE 1. - Summary of estimated original oil-in-place, ultimate recovery, reserves and target oil for 50 largest oilfields in the Permian Basin of West Texas and SE New Mexico, in thousand barrels

No.	Field-reservoir	State dist.	Original O.I.P.	Ultimate recovery	Reserves as of 12-31-76	Target oil
1.	YATES-Grayburg	Tx.8	4,018,000	2,000,000	1,352,900	2,018,000
2.	KELLY SNYDER-Canyon Reef	Tx.8A	2,223,000	1,309,500	426,900	913,500
3.	WASSON-San Andres	Tx.8A	4,315,000	1,294,500	331,900	3,020,500
4.	SLAUGHTER-San Andres	Tx.8A	1,860,000	972,800	287,100	887,200
5.	McELROY-Grayburg	Tx.7C	2,642,000	510,000	175,600	2,132,000
6.	SEMINOLE-San Andres	Tx.8A	1,052,000	403,000	175,500	649,000
7.	COWDEN,N.-Grayburg	Tx.8	1,063,000	401,100	128,300	661,900
8.	WARD ESTES,N.-Yates	Tx.8	749,000	380,000	60,300	369,000
9.	EUNICE MONUMENT-Grayburg	SE.N.M.	2,000,000	380,000	55,400	1,620,000
10.	LEVELLAND-San Andres	Tx.8A	1,069,000	363,000	104,500	706,000
11.	GOLDSMITH-San Andres	Tx.8	757,000	340,000	46,000	417,000
12.	HOWARD GLASSCOCK-Commin.	Tx.8	1,270,000	338,000	29,300	932,000
13.	FULLERTON-Clearfork	Tx.8	1,140,000	310,000	126,900	830,000
14.	HOBBS-San Andres	SE.N.M.	768,000	270,500	40,100	497,500
15.	COGDELL-Canyon Reef	Tx.8A	521,000	263,000	51,200	258,000
16.	HENDRICKS-Yates	Tx.8	813,800	260,000	6,600	553,800
17.	DIAMOND M-Canyon	Tx.8A	577,000	260,000	57,600	317,000
18.	SALT CREEK-Canyon	Tx.8A	521,900	240,000	91,600	281,900
19.	FOSTER-Grayburg	Tx.8	764,400	233,000	48,300	531,400
20.	GOLDSMITH-5600-Clearfork	Tx.8	710,000	212,000	22,800	498,000
21.	EMPIRE-Abo	SE.N.M.	387,000	208,000	64,900	179,000
22.	VACUUM-Grayburg	SE.N.M.	908,000	205,000	39,800	703,000
23.	BLOCK 31-Devonian	Tx.8	428,200	186,300	42,600	241,900
24.	ANDECTOR-Ellenburger	Tx.8	294,900	184,000	51,100	110,900
25.	DUNE-San Andres	Tx.8	522,000	153,000	24,500	369,000
26.	COWDEN,S.-San Andres	Tx.8	569,000	150,000	40,100	419,000
27.	KEYSTONE-Ellenburger	Tx.8	347,000	146,000	5,700	201,000
28.	MEANS-Grayburg	Tx.8	493,000	146,000	32,700	347,000
29.	ANTON IRISH-Clearfork	Tx.8A	458,000	140,000	47,000	318,000
30.	MALJAMAR-Grayburg	SE.N.M.	479,000	136,000	25,500	343,000
31.	TXL-Ellenburger	Tx.8	341,000	135,000	10,700	206,000
32.	MIDLAND FARMS-Grayburg	Tx.8	534,000	133,000	26,800	401,000
33.	McCAMEY-Grayburg	Tx.7C	496,000	130,000	4,300	366,000
34.	BIG LAKE-Commingled	Tx.7C	277,000	129,000	5,000	148,000
35.	WELCH-San Andres	Tx.8A	508,000	123,000	26,300	385,000

TABLE 1. - Summary of estimated original oil-in-place, ultimate recovery, reserves and target oil for 50 largest oilfields in the Permian Basin of West Texas and SE New Mexico, in thousand barrels--Continued

No.	Field-reservoir	State dist.	Original O-I-P	Ultimate recovery	Reserves as of 12-31-76	Target oil
36.	IATAN,E.HOWARD-Clearfork	Tx.8	317,000	114,000	19,500	203,000
37.	LANGLIE-MATTIX-Commingled	SE.N.M.	527,000	112,000	17,100	415,000
38.	SAND HILLS-San Andres	Tx.8	705,000	112,000	14,400	593,000
39.	PRENTICE 6700-Clearfork	Tx.8A	464,300	110,800	49,200	353,500
40.	KERMIT-Yates	Tx.8	364,000	105,000	3,800	259,000
41.	WARD,S.-Yates	Tx.8	269,000	99,000	3,100	170,000
42.	WADDELL-Grayburg	Tx.8	235,000	98,000	13,300	137,000
43.	DENTON-Devonian	SE.N.M.	321,100	96,800	6,400	224,300
44.	FUHRMAN-MASCHO-Grayburg	Tx.8	560,000	91,000	14,000	469,000
45.	VACUUM-Abo Reef	SE.N.M.	304,000	88,000	17,500	216,000
46.	PEGASUS-Ellenburger	Tx.7C	238,300	87,400	4,300	150,900
47.	SAND HILLS-Tubbs	Tx.8	741,000	86,000	11,000	655,000
48.	JORDAN-San Andres	Tx.8	293,000	84,000	16,200	209,000
49.	DRINKARD-Yeso	SE.N.M.	585,400	81,500	10,000	503,900
50.	GRAYBURG-JACKSON-Queen	SE.N.M.	296,000	81,000	4,800	215,000
	TOTAL		42,096,300	14,491,200	4,270,400	27,605,100

EOR METHOD SELECTION

The procedure for selecting the best EOR process was to use available published data, the NPC's screening criteria, and judgment. However, a much more sophisticated screening procedure is needed before assuming any of the suggested processes are the ultimate for the reservoirs shown. This is especially true when one considers the wide range of values found in the literature for the reservoir and fluid characteristics.

RESULTS OF THE SCREENING ANALYSIS

The reservoirs were screened to find the most suitable EOR method for each of the selected oilfields. If the values of the reservoir and fluid parameters are within specific EOR process limits, they are so indicated in tables A-1 through A-50. The results are presented in Appendix A.

The screening criteria shown in table 2 indicate that none of the 50 major fields in the Permian Basin has adequate characteristics for a steam-drive or in-situ combustion process. These two processes normally lend themselves to shallow reservoirs with low gravity viscous crudes, high permeability, and large quantities of oil per acre-foot in place. Of the three remaining EOR methods, the surfactant polymer was also eliminated, primarily because the fields considered did not meet the lithology screening criteria. To summarize the results of table 3, there are 16 fields with carbon dioxide potential, 11 fields with polymer waterflooding potential, no fields with surfactant polymer potential, and the remaining 23 fields do not meet selection criteria for any one of the five EOR processes considered. Also, the target oil by EOR method is presented in table 3.

Of the 27.6 billion barrels of target oil, 10.4 billion is susceptible to the CO_2 flooding process, 6.1 billion is susceptible to polymer flooding, and the remaining 11.1 billion barrels is not listed under any of the five EOR methods. As stated previously, this is a preliminary screening process based on available published data for each reservoir and the screening criteria published by NPC. Therefore, the selected EOR process shown for each field should not be considered the only method of increasing recovery, nor does it suggest that the EOR process will be successful.

TABLE 2. - Screening criteria standards for enhanced oil recovery methods (3)

Screening parameters	Enhanced oil recovery (EOR) method		
	Surfactant	Polymer	Carbon dioxide
1. Oil gravity, °API...	≥ 25	--	≥27
2. Oil viscosity, cp...	≤ 30	≤ 200	≤10
3. Depth, ft	--	--	> 2,300
4. BHT, °F.....	≤250	≤ 200	< 250
5. Permeability, md ...	≥ 20	≥ 20	--
6. Salinity (TDS), ppm	≤ 200,000	--	--
7. Remaining oil in place after ultimate recovery, % of initial oil in place...	≥ 25	≥ 50	≥ 25
8. Lithology.....	Sandstone	--	Sandstone or Carbonate
9. Original BHP, psi ..	--	--	> 1200
10. Natural H_2O drive...	0 to weak	0 to weak	0 to weak
11. Gas cap.....	0 to minor	0 to minor	0 to minor
12. Fractured.....	0 to minor	0 to minor	0 to minor
13. Hardness, ppm	< 1,000	--	--

TABLE 3. - Summary of 50 largest oil fields in the Permian Basin of West Texas and SE New Mexico indicating target oil available for possible recovery by enhanced oil recovery methods, in thousands of barrels

No.	Field-reservoir	State dist.	None	CO_2 miscible	Polymer H_2O flood	Surfactant
1.	YATES-Grayburg	Tx.8	2,018,000			
2.	KELLY SNYDER-Canyon R.	Tx.8A		913,500		
3.	WASSON-San Andres	Tx.8A		3,020,500		
4.	SLAUGHTER-San Andres	Tx.8A		887,200		
5.	McELROY-Grayburg	Tx.7C			2,132,000	
6.	SEMINOLE-San Andres	Tx.8A	649,000			
7.	COWDEN,N.-Grayburg	Tx.8		661,900		
8.	WARD ESTES,N.-Yates	Tx.8	369,000			
9.	EUNICE MONUMENT-G.B.	SE.N.M.	1,620,000			
10.	LEVELLAND-San Andres	Tx.8A		706,000		
11.	GOLDSMITH-San Andres	Tx.8			417,000	
12.	HOWARD GLASSCOCK-Comm.	Tx.8			932,000	
13.	FULLERTON-Clearfork	Tx.8		830,000		
14.	HOBBS-San Andres	Se.N.M.	497,500			
15.	COGDELL-Canyon Reef	Tx.8A			258,000	
16.	HENDRICKS-Yates	Tx.8	553,800			
17.	DIAMOND M-Canyon	Tx.8A	317,000			
18.	SALT CREEK-Canyon	Tx.8A		281,900		
19.	FOSTER-Grayburg	Tx.8		531,400		
20.	GOLDSMITH-5600-U.Clearf.	Tx.8			498,000	
21.	EMPIRE-Abo	SE.N.M.	179,000			
22.	VACUUM-Grayburg	SE.N.M.	703,000			
23.	BLOCK 31-Devonian	Tx.8		241,900		
24.	ANDECTOR-Ellenburger	Tx.8	110,900			
25.	DUNE-San Andres	Tx.8		369,000		
26.	COWDEN,S.-San Andres	Tx.8		419,000		
27.	KEYSTONE-Ellenburger	Tx.8	201,000			
28.	MEANS-Grayburg	Tx.8			347,000	
29.	ANTON IRISH-Clearfork	Tx.8A			318,000	
30.	MALJAMAR-Grayburg	SE.N.M.		343,000		
31.	TXL-Ellenburger	Tx.8	206,000			
32.	MIDLAND FARMS-Grayburg	Tx.8	401,000			
33.	McCAMEY-Grayburg	Tx.7C	366,000			
34.	BIG LAKE-Commingled	Tx.7C	148,000			
35.	WELCH-San Andres	Tx.8A		385,000		

TABLE 3. - Summary of 50 largest oil fields in the Permian Basin of West Texas and SE New Mexico indicating target oil available for possible recovery by enhanced oil recovery methods, in thousands of barrels--Continued

No.	Field-reservoir	State dist.	None	CO_2 miscible	Polymer H_2O flood	Surfactant
36.	IATAN,E.HOWARD-Clearf.	Tx.8		203,000		
37.	LANGIE MATTIX-Comming.	SE.N.M.	415,000			
38.	SAND HILLS-San Andres	Tx.8			593,000	
39.	PRENTICE 6700-Clearfork	Tx.8A		353,500		
40.	KERMIT-Yates	Tx.8			259,000	
41.	WARD,S.-Yates	Tx.8			170,000	
42.	WADDELL-Grayburg	Tx.8	137,000			
43.	DENTON-Devonian	SE.N.M.	224,300			
44.	FUHRMAN MASCHO-Grayburg	Tx.8	469,000			
45.	VACUUM-Abo Reef	SE.N.M.		216,000		
46.	PEGASUS-Ellenburger	Tx.7C	150,900			
47.	SAND HILLS-Tubbs	Tx.8	655,000			
48.	JORDAN-San Andres	Tx.8	209,000			
49.	DRINKARD-Yeso	SE.N.M.	503,900			
50.	GRAYBURG-JACKSON-Queen	SE.N.M.			215,000	
	TOTAL		11,103,300	10,362,800	6,139,000	0

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APPENDIX A

TABLE A-1. - Criteria for screening the YATES FIELD-Grayburg Reservoir for possible enhanced oil recovery methods

Screening parameters	Reservoir and/or fluid data	Enhanced oil recovery (EOR) method		
		Surfactant	Polymer	Carbon dioxide
1. Oil gravity, °API...	30	X	X	X
2. Oil viscosity, cp...	5.7	X	X	X
3. Depth, ft	1500	X	X	
4. BHT, °F.....	82	X	X	X
5. Permeability, md ...	118	X	X	X
6. Salinity (TDS), ppm	10,000	X	X	X
7. Remaining oil in place after ultimate recovery, % of initial oil in place...	50	X	X	X
8. Lithology.....	carbonate		X	X
9. Original BHP, psi...	700	X	X	
10. Natural H_2O drive...	weak	X	X	X
11. Gas cap.....	yes			
12. Fractured.....	no	X	X	X
13. Hardness, ppm	502	X	X	X

Most suitable EOR method according to criteria: none[1/]

NOTE.-- X = within limits or not critical.

1/ Because of large secondary gas cap.

TABLE A-2. - Criteria for screening the KELLY SNYDER FIELD-Canyon Reservoir for possible enhanced oil recovery methods

Screening parameters	Reservoir and/or fluid data	Enhanced oil recovery (EOR) method		
		Surfactant	Polymer	Carbon dioxide
1. Oil gravity, °API...	43	X	X	X
2. Oil viscosity, cp...	0.38	X	X	X
3. Depth, ft	6795	X	X	X
4. BHT, °F.....	130	X	X	X
5. Permeability, md ...	31	X	X	X
6. Salinity (TDS), ppm	59,000	X	X	X
7. Remaining oil in place after ultimate recovery, % of initial oil in place...	41	X		X
8. Lithology.....	carbonate		X	X
9. Original BHP, psi...	3122	X	X	X
10. Natural H_2O drive...	no	X	X	X
11. Gas cap.....	no	X	X	X
12. Fractured.....	no	X	X	X
13. Hardness, ppm	3700		X	X

Most suitable EOR method according to criteria: carbon dioxide[1/]

NOTE.-- X = within limits or not critical.

1/ carbon dioxide flood currently in operation.

TABLE A-3. - Criteria for screening the WASSON FIELD-San Andres Reservoir for possible enhanced oil recovery methods

Screening parameters	Reservoir and/or fluid data	Enhanced oil recovery (EOR) method		
		Surfactant	Polymer	Carbon dioxide
1. Oil gravity, °API...	35	X	X	X
2. Oil viscosity, cp...	1.1	X	X	X
3. Depth, ft	4900	X	X	X
4. BHT, °F.....	108	X	X	X
5. Permeability, md ...	5			X
6. Salinity (TDS), ppm	2775	X	X	X
7. Remaining oil in place after ultimate recovery, % of initial oil in place...	70	X	X	X
8. Lithology.....	carbonate		X	X
9. Original BHP, psi...	1850	X	X	X
10. Natural H_2O drive...	no	X	X	X
11. Gas cap.....	no	X	X	X
12. Fractured.....	no	X	X	X
13. Hardness, ppm	91	X	X	X

Most suitable EOR method according to criteria: carbon dioxide[1/]

NOTE.-- X = within limits or not critical.

1/ carbon dioxide flood being investigated.

TABLE A-4.- Criteria for screening the SLAUGHTER FIELD-San Andres Reservoir for possible enhanced oil recovery methods

Screening parameters	Reservoir and/or fluid data	Enhanced oil recovery (EOR) method		
		Surfactant	Polymer	Carbon dioxide
1. Oil gravity, °API...	32	X	X	X
2. Oil viscosity, cp...	1.65	X	X	X
3. Depth, ft	5000	X	X	X
4. BHT, °F.....	108	X	X	X
5. Permeability, md ...	11			X
6. Salinity (TDS), ppm	150000	X	X	X
7. Remaining oil in place after ultimate recovery, % of initial oil in place...	48	X		X
8. Lithology.....	carbonate		X	X
9. Original BHP, psi...	1750	X	X	X
10. Natural H_2O drive...	no	X	X	X
11. Gas cap.....	no	X	X	X
12. Fractured.....	no	X	X	X
13. Hardness, ppm	19000		X	X

Most suitable EOR method according to criteria: carbon dioxide

NOTE.-- X = within limits or not critical.

TABLE A-5. - Criteria for screening the McELROY FIELD-Grayburg Reservoir for possible enhanced oil recovery methods

Screening parameters	Reservoir and/or fluid data	Enhanced oil recovery (EOR) method		
		Surfactant	Polymer	Carbon dioxide
1. Oil gravity, °API...	32	X	X	X
2. Oil viscosity, cp...	2.6	X	X	X
3. Depth, ft	2900	X	X	X
4. BHT, °F.....	86	X	X	X
5. Permeability, md ...	50	X	X	X
6. Salinity (TDS), ppm	14600	X	X	X
7. Remaining oil in place after ultimate recovery, % of initial oil in place...	81	X	X	X
8. Lithology.....	carbonate		X	X
9. Original BHP, psi...	755	X	X	
10. Natural H_2O drive...	no	X	X	X
11. Gas cap.....	no	X	X	X
12. Fractured.....	minor	X	X	X
13. Hardness, ppm	1433		X	X

Most suitable EOR method according to criteria: polymer

NOTE.-- X = within limits or not critical.

TABLE A-6. - Criteria for screening the SEMINOLE FIELD-San Andres Reservoir for possible enhanced oil recovery methods

Screening parameters	Reservoir and/or fluid data	Enhanced oil recovery (EOR) method		
		Surfactant	Polymer	Carbon dioxide
1. Oil gravity, °API...	37	X	X	X
2. Oil viscosity, cp...	0.92	X	X	X
3. Depth, ft	5032	X	X	X
4. BHT, °F.....	108	X	X	X
5. Permeability, md ...	19			X
6. Salinity (TDS), ppm	38000	X	X	X
7. Remaining oil in place after ultimate recovery, % of initial oil in place...	62	X	X	X
8. Lithology.....	carbonate		X	X
9. Original BHP, psi...	2050	X	X	X
10. Natural H_2O drive...	no	X	X	X
11. Gas cap.....	yes			
12. Fractured.....	no	X	X	X
13. Hardness, ppm	2480		X	X

Most suitable EOR method according to criteria: none[1/]

NOTE.-- X = within limits or not critical.

1/ Gas cap

TABLE A-7. - Criteria for screening the COWDEN, N. FIELD-Grayburg Reservoir for possible enhanced oil recovery methods

Screening parameters	Reservoir and/or fluid data	Enhanced oil recovery (EOR) method		
		Surfactant	Polymer	Carbon dioxide
1. Oil gravity, °API...	34	X	X	X
2. Oil viscosity, cp...	1.75	X	X	X
3. Depth, ft	4400	X	X	X
4. BHT, °F.....	93	X	X	X
5. Permeability, md ...	10			X
6. Salinity (TDS), ppm	-			
7. Remaining oil in place after ultimate recovery, % of initial oil in place...	62	X	X	X
8. Lithology.....	carbonate		X	X
9. Original BHP, psi...	1800	X	X	X
10. Natural H_2O drive...	no	X	X	X
11. Gas cap.....	yes			
12. Fractured.....	no	X	X	X
13. Hardness, ppm	3350		X	X

Most suitable EOR method according to criteria: carbon dioxide

NOTE.-- X = within limits or not critical.

TABLE A-8 - Criteria for screening the WARD ESTES N. FIELD-Yates Reservoir for possible enhanced oil recovery methods

Screening parameters	Reservoir and/or fluid data	Enhanced oil recovery (EOR) method		
		Surfac-tant	Polymer	Carbon dioxide
1. Oil gravity, °API...	30	X	X	X
2. Oil viscosity, cp...	1.39	X	X	X
3. Depth, ft	3000	X	X	X
4. BHT, °F.....	81	X	X	X
5. Permeability, md ...	100	X	X	X
6. Salinity (TDS), ppm	-			
7. Remaining oil in place after ultimate recovery, % of initial oil in place...	49	X		X
8. Lithology.....	sand	X	X	X
9. Original BHP, psi...	1400	X	X	X
10. Natural H_2O drive...	no	X	X	X
11. Gas cap.....	yes			
12. Fractured.....	no	X	X	X
13. Hardness, ppm	-			

Most suitable EOR method according to criteria: none1/

NOTE.-- X = within limits or not critical.

1/ Gas cap

TABLE A-9. - Criteria for screening the EUNICE MONUMENT FIELD-Grayburg Reservoir for possible enhanced oil recovery methods

Screening parameters	Reservoir and/or fluid data	Enhanced oil recovery (EOR) method		
		Surfactant	Polymer	Carbon dioxide
1. Oil gravity, °API...	32	X	X	X
2. Oil viscosity, cp...	8	X	X	X
3. Depth, ft	3650	X	X	X
4. BHT, °F.....	90	X	X	X
5. Permeability, md ...	35	X	X	X
6. Salinity (TDS), ppm	-			
7. Remaining oil in place after ultimate recovery, % of initial oil in place...	81	X	X	X
8. Lithology.....	sand	X	X	X
9. Original BHP, psi...	1450	X	X	X
10. Natural H_2O drive...	yes			
11. Gas cap.....	no	X	X	X
12. Fractured.....	no	X	X	X
13. Hardness, ppm	-			

Most suitable EOR method according to criteria: none[1/]

NOTE.-- X = within limits or not critical.

1/ Water drive

TABLE A-10 - Criteria for screening the LEVELLAND FIELD-San Andres Reservoir for possible enhanced oil recovery methods

Screening parameters	Reservoir and/or fluid data	Enhanced oil recovery (EOR) method		
		Surfac-tant	Polymer	Carbon dioxide
1. Oil gravity, °API...	29	X	X	X
2. Oil viscosity, cp...	3	X	X	X
3. Depth, ft	4927	X	X	X
4. BHT, °F.....	108	X	X	X
5. Permeability, md ...	3			X
6. Salinity (TDS), ppm	-			
7. Remaining oil in place after ultimate recovery, % of initial oil in place...	66	X	X	X
8. Lithology.....	carbonate		X	X
9. Original BHP, psi...	1704	X	X	X
10. Natural H_2O drive...	no	X	X	X
11. Gas cap.....	no	X	X	X
12. Fractured.....	no	X	X	X
13. Hardness, ppm	-			

Most suitable EOR method according to criteria: carbon dioxide

NOTE.-- X = within limits or not critical.

TABLE A-11 - Criteria for screening the GOLDSMITH FIELD-San Andres Reservoir for possible enhanced oil recovery methods

Screening parameters	Reservoir and/or fluid data	Enhanced oil recovery (EOR) method		
		Surfactant	Polymer	Carbon dioxide
1. Oil gravity, °API...	35	X	X	X
2. Oil viscosity, cp...	0.91	X	X	X
3. Depth, ft	4300	X	X	X
4. BHT, °F.....	94	X	X	X
5. Permeability, md ...	25	X	X	X
6. Salinity (TDS), ppm	-			
7. Remaining oil in place after ultimate recovery, % of initial oil in place...	55	X	X	X
8. Lithology.....	carbonate		X	X
9. Original BHP, psi...	1727	X	X	X
10. Natural H_2O drive...	no	X	X	X
11. Gas cap.....	no	X	X	X
12. Fractured.....	no	X	X	X
13. Hardness, ppm	-			

Most suitable EOR method according to criteria: polymer[1/]

NOTE.-- X = within limits or not critical.
1/ It was assumed that polymers will be more readily available than carbon dioxide.

TABLE A-12. - Criteria for screening the HOWARD GLASSCOCK-Commingled Reservoirs for possible enhanced oil recovery methods

Screening parameters	Reservoir and/or fluid data	Enhanced oil recovery (EOR) method		
		Surfactant	Polymer	Carbon dioxide
1. Oil gravity, °API...	33	X	X	X
2. Oil viscosity, cp...	10.4	X	X	
3. Depth, ft	1400	X	X	
4. BHT, °F.....	83	X	X	X
5. Permeability, md ...	200	X	X	X
6. Salinity (TDS), ppm	-			
7. Remaining oil in place after ultimate recovery, % of initial oil in place...	73	X	X	X
8. Lithology.....	sand	X	X	X
9. Original BHP, psi...	550	X	X	
10. Natural H_2O drive...	no	X	X	X
11. Gas cap.....	no	X	X	X
12. Fractured.....	no	X	X	X
13. Hardness, ppm	-			

Most suitable EOR method according to criteria: polymer 1/

NOTE.-- X = within limits or not critical.
1/ Commingled.

TABLE A-13. - Criteria for screening the FULLERTON FIELD-Clearfork Reservoir for possible enhanced oil recovery methods

Screening parameters	Reservoir and/or fluid data	Enhanced oil recovery (EOR) method		
		Surfactant	Polymer	Carbon dioxide
1. Oil gravity, °API...	43	X	X	X
2. Oil viscosity, cp...	0.46	X	X	X
3. Depth, ft	7300	X	X	X
4. BHT, °F.....	105	X	X	X
5. Permeability, md ...	3			X
6. Salinity (TDS), ppm	60000	X	X	X
7. Remaining oil in place after ultimate recovery, % of initial oil in place...	73	X	X	X
8. Lithology.....	carbonate		X	X
9. Original BHP, psi...	2938	X	X	X
10. Natural H_2O drive...	no	X	X	X
11. Gas cap.....	no	X	X	X
12. Fractured.....	no	X	X	X
13. Hardness, ppm	-			

Most suitable EOR method according to criteria: carbon dioxide

NOTE.-- X = within limits or not critical.

TABLE A-14.- Criteria for screening the HOBBS FIELD-San Andres Reservoir for possible enhanced oil recovery methods

Screening parameters	Reservoir and/or fluid data	Enhanced oil recovery (EOR) method		
		Surfac-tant	Polymer	Carbon dioxide
1. Oil gravity, °API...	34	X	X	X
2. Oil viscosity, cp...	8	X	X	X
3. Depth, ft	4065	X	X	X
4. BHT, °F.....	100	X	X	X
5. Permeability, md ...	50	X	X	X
6. Salinity (TDS), ppm	-			
7. Remaining oil in place after ultimate recovery, % of initial oil in place...	65	X	X	X
8. Lithology.....	carbonate		X	X
9. Original BHP, psi...	1525	X	X	X
10. Natural H_2O drive...	yes			
11. Gas cap.....	yes			
12. Fractured.....	no	X	X	X
13. Hardness, ppm	590	X	X	X

Most suitable EOR method according to criteria: none[1/]

NOTE.-- X = within limits or not critical.

1/ Water drive and gas cap.

TABLE A-15. - Criteria for screening the COGDELL FIELD-Canyon Reef Reservoir for possible enhanced oil recovery methods

Screening parameters	Reservoir and/or fluid data	Enhanced oil recovery (EOR) method		
		Surfac-tant	Polymer	Carbon dioxide
1. Oil gravity, °API...	43	X	X	X
2. Oil viscosity, cp...	0.44	X	X	X
3. Depth, ft	6796	X	X	X
4. BHT, °F.....	136	X	X	X
5. Permeability, md ...	18			X
6. Salinity (TDS), ppm	-			
7. Remaining oil in place after ultimate recovery, % of initial oil in place...	50	X	X	X
8. Lithology.....	carbonate		X	X
9. Original BHP, psi...	3120	X	X	X
10. Natural H_2O drive...	no	X	X	X
11. Gas cap.....	no	X	X	X
12. Fractured.....	no	X	X	X
13. Hardness, ppm	8050		X	X

Most suitable EOR method according to criteria: polymer[1/]

NOTE.-- X = within limits or not critical.
1/ It was assumed that polymers will be more readily available than carbon dioxide.

TABLE A-16. - Criteria for screening the HENDRICKS FIELD-Yates Reservoir for possible enhanced oil recovery methods

Screening parameters	Reservoir and/or fluid data	Enhanced oil recovery (EOR) method		
		Surfactant	Polymer	Carbon dioxide
1. Oil gravity, °API...	35	X	X	X
2. Oil viscosity, cp...	5	X	X	X
3. Depth, ft	3100	X	X	X
4. BHT, °F.....	127	X	X	X
5. Permeability, md ...	14			X
6. Salinity (TDS), ppm	21500	X	X	X
7. Remaining oil in place after ultimate recovery, % of initial oil in place...	68	X	X	X
8. Lithology.....	carbonate		X	X
9. Original BHP, psi...	1400	X	X	X
10. Natural H_2O drive...	yes			
11. Gas cap.....	no	X	X	X
12. Fractured.....	yes			
13. Hardness, ppm	1564		X	X

Most suitable EOR method according to criteria: none[1/]

NOTE.-- X = within limits or not critical.

1/ Water drive and fractured.

TABLE A-17. - Criteria for screening the DIAMOND M FIELD-Canyon Reservoir for possible enhanced oil recovery methods

Screening parameters	Reservoir and/or fluid data	Enhanced oil recovery (EOR) method		
		Surfac-tant	Polymer	Carbon dioxide
1. Oil gravity, °API...	43	X	X	X
2. Oil viscosity, cp...	0.46	X	X	X
3. Depth, ft	6569	X	X	X
4. BHT, °F.....	130	X	X	X
5. Permeability, md ...	44	X	X	X
6. Salinity (TDS), ppm	50000	X	X	X
7. Remaining oil in place after ultimate recovery, % of initial oil in place...	55	X	X	X
8. Lithology.....	carbonate		X	X
9. Original BHP, psi...	3120	X	X	X
10. Natural H_2O drive...	yes			
11. Gas cap.....	no	X	X	X
12. Fractured.....	no	X	X	X
13. Hardness, ppm	4175		X	X

Most suitable EOR method according to criteria: none[1/]

NOTE.-- X = within limits or not critical.

1/ Water drive.

TABLE A-18. - Criteria for screening the SALT CREEK FIELD-Canyon Reservoir for possible enhanced oil recovery methods

Screening parameters	Reservoir and/or fluid data	Enhanced oil recovery (EOR) method		
		Surfac-tant	Polymer	Carbon dioxide
1. Oil gravity, °API...	39	X	X	X
2. Oil viscosity, cp...	0.79	X	X	X
3. Depth, ft	6200	X	X	X
4. BHT, °F.....	129	X	X	X
5. Permeability, md ...	12			X
6. Salinity (TDS), ppm	128000	X	X	X
7. Remaining oil in place after ultimate recovery, % of initial oil in place...	54	X	X	X
8. Lithology.....	carbonate		X	X
9. Original BHP, psi...	2940	X	X	X
10. Natural H_2O drive...	no	X	X	X
11. Gas cap.....	no	X	X	X
12. Fractured.....	no	X	X	X
13. Hardness, ppm	-			

Most suitable EOR method according to criteria: carbon dioxide

NOTE.-- X = within limits or not critical.

TABLE A-19.- Criteria for screening the FOSTER FIELD-Grayburg Reservoir for possible enhanced oil recovery methods

Screening parameters	Reservoir and/or fluid data	Enhanced oil recovery (EOR) method		
		Surfactant	Polymer	Carbon dioxide
1. Oil gravity, °API...	39	X	X	X
2. Oil viscosity, cp...	2.6	X	X	X
3. Depth, ft	4300	X	X	X
4. BHT, °F.....	96	X	X	X
5. Permeability, md ...	3			X
6. Salinity (TDS), ppm	-			
7. Remaining oil in place after ultimate recovery, % of initial oil in place...	70	X	X	X
8. Lithology.....	carbonate		X	X
9. Original BHP, psi...	1740	X	X	X
10. Natural H_2O drive...	no	X	X	X
11. Gas cap.....	no	X	X	X
12. Fractured.....	no	X	X	X
13. Hardness, ppm	25030		X	X

Most suitable EOR method according to criteria: carbon dioxide

NOTE.-- X = within limits or not critical.

TABLE A-20.- Criteria for screening the GOLDSMITH-5600 FIELD-U. Clearfork Res. for possible enhanced oil recovery methods

Screening parameters	Reservoir and/or fluid data	Enhanced oil recovery (EOR) method		
		Surfactant	Polymer	Carbon dioxide
1. Oil gravity, °API...	38	X	X	X
2. Oil viscosity, cp...	1.1	X	X	X
3. Depth, ft	5600	X	X	X
4. BHT, °F.....	105	X	X	X
5. Permeability, md ...	28	X	X	X
6. Salinity (TDS), ppm	-			
7. Remaining oil in place after ultimate recovery, % of initial oil in place...	70	X	X	X
8. Lithology.....	carbonate		X	X
9. Original BHP, psi...	2330	X	X	X
10. Natural H_2O drive...	no	X	X	X
11. Gas cap.....	no	X	X	X
12. Fractured.....	no	X	X	X
13. Hardness, ppm	-			

Most suitable EOR method according to criteria: polymer1/

NOTE.-- X = within limits or not critical.
1/ It was assumed that polymers will be more readily available than carbon dioxide.

TABLE A-21 - Criteria for screening the EMPIRE FIELD-Abo Reservoir for possible enhanced oil recovery methods

Screening parameters	Reservoir and/or fluid data	Enhanced oil recovery (EOR) method		
		Surfactant	Polymer	Carbon dioxide
1. Oil gravity, °API...	43	X	X	X
2. Oil viscosity, cp...	2.2	X	X	X
3. Depth, ft	6015	X	X	X
4. BHT, °F.....	109	X	X	X
5. Permeability, md ...	5			X
6. Salinity (TDS), ppm	-			
7. Remaining oil in place after ultimate recovery, % of initial oil in place...	46	X		X
8. Lithology.....	carbonate		X	X
9. Original BHP, psi...	2396	X	X	X
10. Natural H_2O drive...	yes			
11. Gas cap.....	no	X	X	X
12. Fractured.....	yes			
13. Hardness, ppm	2312		X	X

Most suitable EOR method according to criteria: none[1/]

NOTE.-- X = within limits or not critical.

1/ Water drive and fractured.

TABLE A-22. - Criteria for screening the VACUUM FIELD-Grayburg Reservoir for possible enhanced oil recovery methods

Screening parameters	Reservoir and/or fluid data	Enhanced oil recovery (EOR) method		
		Surfac-tant	Polymer	Carbon dioxide
1. Oil gravity, °API...	36	X	X	X
2. Oil viscosity, cp...	6	X	X	X
3. Depth, ft	4315	X	X	X
4. BHT, °F.....	89	X	X	X
5. Permeability, md ...	404	X	X	X
6. Salinity (TDS), ppm	-			
7. Remaining oil in place after ultimate recovery, % of initial oil in place...	77	X	X	X
8. Lithology.....	carbonate		X	X
9. Original BHP, psi...	1660	X	X	X
10. Natural H_2O drive...	yes			
11. Gas cap.....	no	X	X	X
12. Fractured.....	no	X	X	X
13. Hardness, ppm	3991		X	X

Most suitable EOR method according to criteria: none 1/

NOTE.-- X = within limits or not critical.

1/ Water drive.

TABLE A-23. - Criteria for screening the BLOCK 31 FIELD-Devonian Reservoir for possible enhanced oil recovery methods

Screening parameters	Reservoir and/or fluid data	Enhanced oil recovery (EOR) method		
		Surfac-tant	Polymer	Carbon dioxide
1. Oil gravity, °API...	41	X	X	X
2. Oil viscosity, cp...	0.3	X	X	X
3. Depth, ft	8810	X	X	X
4. BHT, °F.....	139	X	X	X
5. Permeability, md ...	1			X
6. Salinity (TDS), ppm	120000	X	X	X
7. Remaining oil in place after ultimate recovery, % of initial oil in place...	56	X	X	X
8. Lithology.....	carbonate		X	X
9. Original BHP, psi...	4145	X	X	X
10. Natural H_2O drive...	no	X	X	X
11. Gas cap.....	no	X	X	X
12. Fractured.....	no	X	X	X
13. Hardness, ppm	-			

Most suitable EOR method according to criteria: carbon dioxide[1/]

NOTE.-- X = within limits or not critical.

1/ Flue gas flood currently in operation.

TABLE A-24.- Criteria for screening the ANDECTOR FIELD-Ellenburger Reservoir for possible enhanced oil recovery methods

Screening parameters	Reservoir and/or fluid data	Enhanced oil recovery (EOR) method		
		Surfactant	Polymer	Carbon dioxide
1. Oil gravity, °API...	44	X	X	X
2. Oil viscosity, cp...	0.67	X	X	X
3. Depth, ft	8545	X	X	X
4. BHT, °F.....	132	X	X	X
5. Permeability, md ...	75	X	X	X
6. Salinity (TDS), ppm	21,736	X	X	X
7. Remaining oil in place after ultimate recovery, % of initial oil in place...	38	X		X
8. Lithology.....	carbonate		X	X
9. Original BHP, psi...	3500	X	X	X
10. Natural H_2O drive...	yes			
11. Gas cap.....	no	X	X	X
12. Fractured.....	yes			
13. Hardness, ppm	-			

Most suitable EOR method according to criteria: none[1/]

NOTE.-- X = within limits or not critical.

1/ Water drive and fractured.

TABLE A-25.- Criteria for screening the DUNE FIELD-San Andres Reservoir for possible enhanced oil recovery methods

Screening parameters	Reservoir and/or fluid data	Enhanced oil recovery (EOR) method		
		Surfactant	Polymer	Carbon dioxide
1. Oil gravity, °API...	36	X	X	X
2. Oil viscosity, cp...	2.92	X	X	X
3. Depth, ft	3270	X	X	X
4. BHT, °F.....	105	X	X	X
5. Permeability, md ...	11			X
6. Salinity (TDS), ppm	-			
7. Remaining oil in place after ultimate recovery, % of initial oil in place...	71	X	X	X
8. Lithology.....	carbonate		X	X
9. Original BHP, psi...	1506	X	X	X
10. Natural H_2O drive...	no	X	X	X
11. Gas cap.....	no	X	X	X
12. Fractured.....	no	X	X	X
13. Hardness, ppm	-			

Most suitable EOR method according to criteria: carbon dioxide

NOTE.-- X = within limits or not critical.

TABLE A-26.- Criteria for screening the COWDEN, S. FIELD-San Andres Reservoir for possible enhanced oil recovery methods

Screening parameters	Reservoir and/or fluid data	Enhanced oil recovery (EOR) method		
		Surfac-tant	Polymer	Carbon dioxide
1. Oil gravity, °API...	34	X	X	X
2. Oil viscosity, cp...	1.27	X	X	X
3. Depth, ft	5050	X	X	X
4. BHT, °F.....	96	X	X	X
5. Permeability, md ...	4			X
6. Salinity (TDS), ppm	-			
7. Remaining oil in place after ultimate recovery, % of initial oil in place...	74	X	X	X
8. Lithology.....	carbonate		X	X
9. Original BHP, psi...	1760	X	X	X
10. Natural H_2O drive...	no	X	X	X
11. Gas cap.....	no	X	X	X
12. Fractured.....	no	X	X	X
13. Hardness, ppm	-			

Most suitable EOR method according to criteria: carbon dioxide

NOTE.-- X = within limits or not critical.

TABLE A-27 - Criteria for screening the KEYSTONE FIELD-Ellenburger Reservoir for possible enhanced oil recovery methods

Screening parameters	Reservoir and/or fluid data	Enhanced oil recovery (EOR) method		
		Surfac-tant	Polymer	Carbon dioxide
1. Oil gravity, °API...	44	X	X	X
2. Oil viscosity, cp...	0.5	X	X	X
3. Depth, ft	9524	X	X	X
4. BHT, °F.....	145	X	X	X
5. Permeability, md ...	75	X	X	X
6. Salinity (TDS), ppm	65600	X	X	X
7. Remaining oil in place after ultimate recovery, % of initial oil in place...	58	X	X	X
8. Lithology.....	carbonate		X	X
9. Original BHP, psi...	4283	X	X	X
10. Natural H_2O drive...	yes			
11. Gas cap.....	yes			
12. Fractured.....	yes			
13. Hardness, ppm	-			

Most suitable EOR method according to criteria: none 1/

NOTE.-- X = within limits or not critical.

1/ Water drive, gas cap, and fractured.

TABLE A-28.- Criteria for screening the MEANS FIELD-Grayburg Reservoir for possible enhanced oil recovery methods

Screening parameters	Reservoir and/or fluid data	Enhanced oil recovery (EOR) method		
		Surfactant	Polymer	Carbon dioxide
1. Oil gravity, °API...	29	X	X	X
2. Oil viscosity, cp...	1.5	X	X	X
3. Depth, ft	4400	X	X	X
4. BHT, °F.....	100	X	X	X
5. Permeability, md ...	3			X
6. Salinity (TDS), ppm	-			
7. Remaining oil in place after ultimate recovery, % of initial oil in place...	70	X	X	X
8. Lithology.....	carbonate		X	X
9. Original BHP, psi...	1850	X	X	X
10. Natural H_2O drive...	weak	X	X	X
11. Gas cap.....	yes			
12. Fractured.....	man-made			
13. Hardness, ppm	11060		X	X

Most suitable EOR method according to criteria: polymer 1/

NOTE.-- X = within limits or not critical.
1/ It was assumed that polymers will be more readily available than carbon dioxide.

TABLE A-29.- Criteria for screening the ANTON IRISH FIELD-Clearfork Reservoir for possible enhanced oil recovery methods

Screening parameters	Reservoir and/or fluid data	Enhanced oil recovery (EOR) method		
		Surfac-tant	Polymer	Carbon dioxide
1. Oil gravity, °API...	31	X	X	X
2. Oil viscosity, cp...	2.73	X	X	X
3. Depth, ft	5348	X	X	X
4. BHT, °F.....	107	X	X	X
5. Permeability, md ...	19			X
6. Salinity (TDS), ppm	148932	X	X	X
7. Remaining oil in place after ultimate recovery, % of initial oil in place...	69	X	X	X
8. Lithology.....	carbonate		X	X
9. Original BHP, psi...	2094	X	X	X
10. Natural H_2O drive...	no	X	X	X
11. Gas cap.....	no	X	X	X
12. Fractured.....	no	X	X	X
13. Hardness, ppm	-			

Most suitable EOR method according to criteria: polymer[1/]

NOTE.-- X = within limits or not critical.
1/ It was assumed that polymers will be more readily available than carbon dioxide.

TABLE A-30.- Criteria for screening the MALJAMAR FIELD-Grayburg Reservoir for possible enhanced oil recovery methods

Screening parameters	Reservoir and/or fluid data	Enhanced oil recovery (EOR) method		
		Surfac-tant	Polymer	Carbon dioxide
1. Oil gravity, °API...	37	X	X	X
2. Oil viscosity, cp...	8	X	X	X
3. Depth, ft	4000	X	X	X
4. BHT, °F.....	80	X	X	X
5. Permeability, md ...	47	X	X	X
6. Salinity (TDS), ppm	212000		X	X
7. Remaining oil in place after ultimate recovery, % of initial oil in place...	72	X	X	X
8. Lithology.....	carbonate		X	X
9. Original BHP, psi...	1350	X	X	X
10. Natural H_2O drive...	no	X	X	X
11. Gas cap.....	no	X	X	X
12. Fractured.....	minor	X	X	X
13. Hardness, ppm	3850		X	X

Most suitable EOR method according to criteria: carbon dioxide 1/

NOTE.-- X = within limits or not critical.
1/ Close to carbon dioxide source.

TABLE A-31.- Criteria for screening the TXL FIELD-Ellenburger Reservoir for possible enhanced oil recovery methods

Screening parameters	Reservoir and/or fluid data	Enhanced oil recovery (EOR) method		
		Surfactant	Polymer	Carbon dioxide
1. Oil gravity, °API...	44	X	X	X
2. Oil viscosity, cp...	0.44	X	X	X
3. Depth, ft	9600	X	X	X
4. BHT, °F.....	138	X	X	X
5. Permeability, md ...	39	X	X	X
6. Salinity (TDS), ppm	25312	X	X	X
7. Remaining oil in place after ultimate recovery, % of initial oil in place...	60	X	X	X
8. Lithology.....	carbonate		X	X
9. Original BHP, psi...	4065	X	X	X
10. Natural H_2O drive...	yes			
11. Gas cap.....	no	X	X	X
12. Fractured.....	yes			
13. Hardness, ppm	2290		X	X

Most suitable EOR method according to criteria: none 1/

NOTE.-- X = within limits or not critical.

1/ Water drive and fractured.

TABLE A-32.- Criteria for screening the MIDLAND FARMS FIELD-Grayburg Reservoir for possible enhanced oil recovery methods

Screening parameters	Reservoir and/or fluid data	Enhanced oil recovery (EOR) method		
		Surfactant	Polymer	Carbon dioxide
1. Oil gravity, °API...	30	X	X	X
2. Oil viscosity, cp...	2.45	X	X	X
3. Depth, ft	4800	X	X	X
4. BHT, °F.....	152	X	X	X
5. Permeability, md ...	61	X	X	X
6. Salinity (TDS), ppm	-			
7. Remaining oil in place after ultimate recovery, % of initial oil in place...	75	X	X	X
8. Lithology.....	carbonate		X	X
9. Original BHP, psi...	1975	X	X	X
10. Natural H_2O drive...	weak	X	X	X
11. Gas cap.....	no	X	X	X
12. Fractured.....	yes			
13. Hardness, ppm	-			

Most suitable EOR method according to criteria: none[1/]

NOTE.-- X = within limits or not critical.

1/ Fractured.

TABLE A-33.- Criteria for screening the McCAMEY FIELD-Grayburg Reservoir for possible enhanced oil recovery methods

Screening parameters	Reservoir and/or fluid data	Enhanced oil recovery (EOR) method		
		Surfactant	Polymer	Carbon dioxide
1. Oil gravity, °API...	26	X	X	
2. Oil viscosity, cp...	1.2	X	X	X
3. Depth, ft	2100	X	X	
4. BHT, °F.....	112	X	X	X
5. Permeability, md ...	79	X	X	X
6. Salinity (TDS), ppm	-			
7. Remaining oil in place after ultimate recovery, % of initial oil in place...	74	X	X	X
8. Lithology.....	carbonate		X	X
9. Original BHP, psi...	1600	X	X	X
10. Natural H_2O drive...	yes			
11. Gas cap.....	yes			
12. Fractured.....	yes			
13. Hardness, ppm	-			

Most suitable EOR method according to criteria: none[1/]

NOTE.-- X = within limits or not critical.

1/ Water drive, gas cap , and fractured.

TABLE A-34.- Criteria for screening the BIG LAKE FIELD-Commingled Reservoir for possible enhanced oil recovery methods

Screening parameters	Reservoir and/or fluid data	Enhanced oil recovery (EOR) method		
		Surfactant	Polymer	Carbon dioxide
1. Oil gravity, °API...	37	X	X	X
2. Oil viscosity, cp...	1.5	X	X	X
3. Depth, ft	3000	X	X	X
4. BHT, °F.....	125	X	X	X
5. Permeability, md ...	20	X	X	X
6. Salinity (TDS), ppm	-			
7. Remaining oil in place after ultimate recovery, % of initial oil in place...	53	X	X	X
8. Lithology.....	carbonate		X	X
9. Original BHP, psi...	1250	X	X	X
10. Natural H_2O drive...	yes			
11. Gas cap.....	no	X	X	X
12. Fractured.....	no	X	X	X
13. Hardness, ppm	2083		X	X

Most suitable EOR method according to criteria: none[1/]

NOTE.-- X = within limits or not critical.

1/ Water drive.

TABLE A-35.- Criteria for screening the WELCH FIELD-San Andres Reservoir for possible enhanced oil recovery methods

Screening parameters	Reservoir and/or fluid data	Enhanced oil recovery (EOR) method		
		Surfactant	Polymer	Carbon dioxide
1. Oil gravity, °API...	33	X	X	X
2. Oil viscosity, cp...	2.32	X	X	X
3. Depth, ft	5000	X	X	X
4. BHT, °F.....	93	X	X	X
5. Permeability, md ...	4			X
6. Salinity (TDS), ppm	-			
7. Remaining oil in place after ultimate recovery, % of initial oil in place...	76	X	X	X
8. Lithology.....	carbonate		X	X
9. Original BHP, psi...	2100	X	X	X
10. Natural H_2O drive...	no	X	X	X
11. Gas cap.....	no	X	X	X
12. Fractured.....	no	X	X	X
13. Hardness, ppm	-			

Most suitable EOR method according to criteria: carbon dioxide

NOTE.-- X = within limits or not critical.

TABLE A-36.- Criteria for screening the IATAN, E.HOWARD FIELD-Clearfork Reservoir for possible enhanced oil recovery methods

Screening parameters	Reservoir and/or fluid data	Enhanced oil recovery (EOR) method		
		Surfactant	Polymer	Carbon dioxide
1. Oil gravity, °API...	30	X	X	X
2. Oil viscosity, cp...	2.0	X	X	X
3. Depth, ft	2700	X	X	X
4. BHT, °F.....	100	X	X	X
5. Permeability, md....	4			X
6. Salinity (TDS), ppm	-			
7. Remaining oil in place after ultimate recovery, % of initial oil in place...	64	X	X	X
8. Lithology.....	carbonate		X	X
9. Original BHP, psi...	950	X	X	
10. Natural H_2O drive...	no	X	X	X
11. Gas cap.....	no	X	X	X
12. Fractured.....	no	X	X	X
13. Hardness, ppm	10700		X	X

Most suitable EOR method according to criteria: carbon dioxide[1/]

NOTE.-- X = within limits or not critical.
1/ Proximity to carbon dioxide sources in Val Verde Basin.

TABLE A-37.- Criteria for screening the LANGLIE MATTIX FIELD-Commingled Reservoir for possible enhanced oil recovery methods

Screening parameters	Reservoir and/or fluid data	Enhanced oil recovery (EOR) method		
		Surfactant	Polymer	Carbon dioxide
1. Oil gravity, °API...	37	X	X	X
2. Oil viscosity, cp...	7	X	X	X
3. Depth, ft	3400	X	X	X
4. BHT, °F.....	87	X	X	X
5. Permeability, md ...	16			X
6. Salinity (TDS), ppm	-			
7. Remaining oil in place after ultimate recovery, % of initial oil in place...	79	X	X	X
8. Lithology.....	sand	X	X	X
9. Original BHP, psi...	1450	X	X	X
10. Natural H_2O drive...	no	X	X	X
11. Gas cap.....	yes			
12. Fractured.....	-			
13. Hardness, ppm	-			

Most suitable EOR method according to criteria: none[1/]

NOTE.-- X = within limits or not critical.

1/ Gas cap.

TABLE A-38 - Criteria for screening the SAND HILLS FIELD-San Andres Reservoir for possible enhanced oil recovery methods

Screening parameters	Reservoir and/or fluid data	Enhanced oil recovery (EOR) method		
		Surfac-tant	Polymer	Carbon dioxide
1. Oil gravity, °API...	35	X	X	X
2. Oil viscosity, cp...	1.17	X	X	X
3. Depth, ft	3420	X	X	X
4. BHT, °F.....	85	X	X	X
5. Permeability, md ...	114	X	X	X
6. Salinity (TDS), ppm	-			
7. Remaining oil in place after ultimate recovery, % of initial oil in place...	84	X	X	X
8. Lithology.....	carbonate		X	X
9. Original BHP, psi...	1510	X	X	X
10. Natural H_2O drive...	no	X	X	X
11. Gas cap.....	no	X	X	X
12. Fractured.....	no	X	X	X
13. Hardness, ppm	7290		X	X

Most suitable EOR method according to criteria: polymer 1/

NOTE.-- X = within limits or not critical.
1/ It was assumed that polymers will be more readily available than carbon dioxide.

TABLE A-39.- Criteria for screening the PRENTICE 6700 FIELD-Clearfork Reservoir for possible enhanced oil recovery methods

Screening parameters	Reservoir and/or fluid data	Enhanced oil recovery (EOR) method		
		Surfactant	Polymer	Carbon dioxide
1. Oil gravity, °API...	28	X	X	X
2. Oil viscosity, cp...	1.68	X	X	X
3. Depth, ft	6700	X	X	X
4. BHT, °F.....	120	X	X	X
5. Permeability, md ...	5			X
6. Salinity (TDS), ppm	-			
7. Remaining oil in place after ultimate recovery, % of initial oil in place...	76	X	X	X
8. Lithology.....	carbonate		X	X
9. Original BHP, psi...	2502	X	X	X
10. Natural H_2O drive...	no	X	X	X
11. Gas cap.....	no	X	X	X
12. Fractured.....	no	X	X	X
13. Hardness, ppm	-			

Most suitable EOR method according to criteria: carbon dioxide

NOTE.-- X = within limits or not critical.

TABLE A-40.- Criteria for screening the KERMIT FIELD-Yates Reservoir for possible enhanced oil recovery methods

Screening parameters	Reservoir and/or fluid data	Enhanced oil recovery (EOR) method		
		Surfac-tant	Polymer	Carbon dioxide
1. Oil gravity, °API...	34	X	X	X
2. Oil viscosity, cp...	2	X	X	X
3. Depth, ft	2800	X	X	X
4. BHT, °F.....	83	X	X	X
5. Permeability, md ...	100	X	X	X
6. Salinity (TDS), ppm	-			
7. Remaining oil in place after ultimate recovery, % of initial oil in place...	71	X	X	X
8. Lithology.....	sand	X	X	X
9. Original BHP, psi...	1450	X	X	X
10. Natural H_2O drive...	no	X	X	X
11. Gas cap.....	no	X	X	X
12. Fractured.....	no	X	X	X
13. Hardness, ppm	-			

Most suitable EOR method according to criteria: polymer[1/]

NOTE.-- X = within limits or not critical.
1/ It was assumed that polymers will be more readily available than carbon dioxide and surfactants.

TABLE A-41.- Criteria for screening the WARD S. FIELD-Commingled Reservoirs for possible enhanced oil recovery methods

Screening parameters	Reservoir and/or fluid data	Enhanced oil recovery (EOR) method		
		Surfactant	Polymer	Carbon dioxide
1. Oil gravity, °API...	36	X	X	X
2. Oil viscosity, cp...	4	X	X	X
3. Depth, ft	2700	X	X	X
4. BHT, °F.....	100	X	X	X
5. Permeability, md ...	83	X	X	X
6. Salinity (TDS), ppm	-			
7. Remaining oil in place after ultimate recovery, % of initial oil in place...	63	X	X	X
8. Lithology.....	sand	X	X	X
9. Original BHP, psi...	1375	X	X	X
10. Natural H_2O drive...	no	X	X	X
11. Gas cap.....	no	X	X	X
12. Fractured.....	no	X	X	X
13. Hardness, ppm	-			

Most suitable EOR method according to criteria: polymer[1/]

NOTE.-- X = within limits or not critical.

1/ It was assumed that polymers will be more readily available than carbon dioxide and surfactants.

TABLE A-42.- Criteria for screening the WADDELL FIELD-Grayburg Reservoir for possible enhanced oil recovery methods

Screening parameters	Reservoir and/or fluid data	Enhanced oil recovery (EOR) method		
		Surfac-tant	Polymer	Carbon dioxide
1. Oil gravity, °API...	35	X	X	X
2. Oil viscosity, cp...	1.62	X	X	X
3. Depth, ft	3500	X	X	X
4. BHT, °F.....	84	X	X	X
5. Permeability, md ...	12			X
6. Salinity (TDS), ppm	-			
7. Remaining oil in place after ultimate recovery, % of initial oil in place...	58	X	X	X
8. Lithology.....	carbonate		X	X
9. Original BHP, psi...	1650	X	X	X
10. Natural H_2O drive...	weak	X	X	X
11. Gas cap.....	no	X	X	X
12. Fractured.....	yes			
13. Hardness, ppm	-			

Most suitable EOR method according to criteria: none[1/]

NOTE.-- X = within limits or not critical.
1/ Fractured.

TABLE A-43. - Criteria for screening the DENTON FIELD-Devonian Reservoir for possible enhanced oil recovery methods

Screening parameters	Reservoir and/or fluid data	Enhanced oil recovery (EOR) method		
		Surfac-tant	Polymer	Carbon dioxide
1. Oil gravity, °API...	45	X	X	X
2. Oil viscosity, cp...	7	X	X	X
3. Depth, ft	11,267	X	X	X
4. BHT, °F.....	177	X	X	X
5. Permeability, md ...	10			X
6. Salinity (TDS), ppm	-			
7. Remaining oil in place after ultimate recovery, % of initial oil in place...	70	X	X	X
8. Lithology.....	carbonate		X	X
9. Original BHP, psi...	5013	X	X	X
10. Natural H_2O drive...	yes			
11. Gas cap.....	no	X	X	X
12. Fractured.....	no	X	X	X
13. Hardness, ppm	-			

Most suitable EOR method according to criteria: none[1/]

NOTE.-- X = within limits or not critical.

1/ Water drive.

TABLE A-44.- Criteria for screening the FUHRMAN MASCHO FIELD-Grayburg Reservoir for possible enhanced oil recovery methods

Screening parameters	Reservoir and/or fluid data	Enhanced oil recovery (EOR) method		
		Surfac-tant	Polymer	Carbon dioxide
1. Oil gravity, °API...	32	X	X	X
2. Oil viscosity, cp...	5.63	X	X	X
3. Depth, ft	4700	X	X	X
4. BHT, °F.....	93	X	X	X
5. Permeability, md ...	3			X
6. Salinity (TDS), ppm	35000	X	X	X
7. Remaining oil in place after ultimate recovery, % of initial oil in place...	84	X	X	X
8. Lithology.....	carbonate		X	X
9. Original BHP, psi...	1800	X	X	X
10. Natural H_2O drive...	no	X	X	X
11. Gas cap.....	yes			
12. Fractured.....	yes			
13. Hardness, ppm	-			

Most suitable EOR method according to criteria: none 1/

NOTE.-- X = within limits or not critical.

1/ Gas cap and fractured.

TABLE A-45.- Criteria for screening the VACUUM FIELD-Abo Reservoir for possible enhanced oil recovery methods

Screening parameters	Reservoir and/or fluid data	Enhanced oil recovery (EOR) method		
		Surfactant	Polymer	Carbon dioxide
1. Oil gravity, °API...	40	X	X	X
2. Oil viscosity, cp...	2	X	X	X
3. Depth, ft	8650	X	X	X
4. BHT, °F.....	136	X	X	X
5. Permeability, md ...	14			X
6. Salinity (TDS), ppm	-			
7. Remaining oil in place after ultimate recovery, % of initial oil in place...	71	X	X	X
8. Lithology.....	carbonate		X	X
9. Original BHP, psi...	3230	X	X	X
10. Natural H_2O drive...	weak	X	X	X
11. Gas cap.....	no	X	X	X
12. Fractured.....	no	X	X	X
13. Hardness, ppm	1710		X	X

Most suitable EOR method according to criteria: carbon dioxide

NOTE.-- X = within limits or not critical.

TABLE A-46.- Criteria for screening the PEGASUS FIELD-Ellenburger Reservoir for possible enhanced oil recovery methods

Screening parameters	Reservoir and/or fluid data	Enhanced oil recovery (EOR) method		
		Surfactant	Polymer	Carbon dioxide
1. Oil gravity, °API...	53	X	X	X
2. Oil viscosity, cp...	0.24	X	X	X
3. Depth, ft	12,530	X	X	X
4. BHT, °F.....	214	X		X
5. Permeability, md ...	9			X
6. Salinity (TDS), ppm	-			
7. Remaining oil in place after ultimate recovery, % of initial oil in place...	63	X	X	X
8. Lithology.....	carbonate		X	X
9. Original BHP, psi...	5668	X	X	X
10. Natural H_2O drive...	no	X	X	X
11. Gas cap.....	no	X	X	X
12. Fractured.....	yes			
13. Hardness, ppm	-			

Most suitable EOR method according to criteria: none[1/]

NOTE.-- X = within limits or not critical.

1/ Fractured.

TABLE A-47. - Criteria for screening the SAND HILLS FIELD-Tubbs Reservoir for possible enhanced oil recovery methods

Screening parameters	Reservoir and/or fluid data	Enhanced oil recovery (EOR) method		
		Surfac-tant	Polymer	Carbon dioxide
1. Oil gravity, °API...	36	X	X	X
2. Oil viscosity, cp...	1.045	X	X	X
3. Depth, ft	4500	X	X	X
4. BHT, °F.....	96	X	X	X
5. Permeability, md ...	39	X	X	X
6. Salinity (TDS), ppm	-			
7. Remaining oil in place after ultimate recovery, % of initial oil in place...	88	X	X	X
8. Lithology.....	carbonate		X	X
9. Original BHP, psi...	-			
10. Natural H_2O drive...	no	X	X	X
11. Gas cap.....	no	X	X	X
12. Fractured.....	minor	X	X	X
13. Hardness, ppm	-			

Most suitable EOR method according to criteria: carbon dioxide[1/]

NOTE.-- X = within limits or not critical.
1/ Poor waterflood characteristics.

TABLE A-48. - Criteria for screening the JORDAN FIELD-San Andres Reservoir for possible enhanced oil recovery methods

Screening parameters	Reservoir and/or fluid data	Enhanced oil recovery (EOR) method		
		Surfactant	Polymer	Carbon dioxide
1. Oil gravity, °API...	36	X	X	X
2. Oil viscosity, cp...	1.11	X	X	X
3. Depth, ft	3700	X	X	X
4. BHT, °F.....	85	X	X	X
5. Permeability, md ...	20	X	X	X
6. Salinity (TDS), ppm	122404	X	X	X
7. Remaining oil in place after ultimate recovery, % of initial oil in place...	71	X	X	X
8. Lithology.....	carbonate		X	X
9. Original BHP, psi...	1550	X	X	X
10. Natural H_2O drive...	no	X	X	X
11. Gas cap.....	yes			
12. Fractured.....	-			
13. Hardness, ppm	-			

Most suitable EOR method according to criteria: none 1/

NOTE.-- X = within limits or not critical.

1/ Gas cap.

TABLE A-49. - Criteria for screening the DRINKARD FIELD-Yeso Reservoir for possible enhanced oil recovery methods

Screening parameters	Reservoir and/or fluid data	Enhanced oil recovery (EOR) method		
		Surfac-tant	Polymer	Carbon dioxide
1. Oil gravity, °API...	40	X	X	X
2. Oil viscosity, cp...	3	X	X	X
3. Depth, ft	6375	X	X	X
4. BHT, °F.....	106	X	X	X
5. Permeability, md ...	.6			X
6. Salinity (TDS), ppm	-			
7. Remaining oil in place after ultimate recovery, % of initial oil in place...	86	X	X	X
8. Lithology.....	carbonate		X	X
9. Original BHP, psi...	2812	X	X	X
10. Natural H_2O drive...	no	X	X	X
11. Gas cap.....	yes			
12. Fractured.....	-			
13. Hardness, ppm	9971		X	X

Most suitable EOR method according to criteria: none 1/

NOTE.-- X = within limits or not critical.

1/ Gas cap.

TABLE A-50.- Criteria for screening the GRAYBURG JACKSON FIELD-Queen Reservoir for possible enhanced oil recovery methods

Screening parameters	Reservoir and/or fluid data	Enhanced oil recovery (EOR) method		
		Surfactant	Polymer	Carbon dioxide
1. Oil gravity, °API...	36	X	X	X
2. Oil viscosity, cp...	6	X	X	X
3. Depth, ft	3000	X	X	X
4. BHT, °F.....	85	X	X	X
5. Permeability, md ...	20	X	X	X
6. Salinity (TDS), ppm	-			
7. Remaining oil in place after ultimate recovery, % of initial oil in place...	73	X	X	X
8. Lithology.....	carbonate		X	X
9. Original BHP, psi...	1300	X	X	X
10. Natural H_2O drive...	no	X	X	X
11. Gas cap.....	no	X	X	X
12. Fractured.....	no	X	X	X
13. Hardness, ppm	-			

Most suitable EOR method according to criteria: polymer 1/

NOTE.-- X = within limits or not critical.
1/ It was assumed that polymers will be more readily available than carbon dioxide.