

TABLE 1
Radioactivity Distribution in Several Types of Gum in Very Unstable Gasoline
Containing Tritium Labeled Compounds¹

Labeled compound	Total Activity in									
	Storage sample		Vacuum transfer gum		Soluble vacuum transfer gum		Insoluble vacuum transfer gum		Air jet gum	
	$\mu\text{C.}^2$	Percent	$\mu\text{C.}^2$	Percent	$\mu\text{C.}^2$	Percent	$\mu\text{C.}^2$	Percent	$\mu\text{C.}^2$	Percent
Substituted benzenes										
C ₆ H ₆ Aromatic blend	94.090	100.00	0.122	0.13	0.098	0.10	0.024	0.03	0.010	0.01
C ₁₀ Aromatic blend	247.270	100.00	1.083	.44	.874	.35	.209	.08	.074	.03
1-Butylbenzene	44.270	100.00	.061	.13	.058	.13	.003	.00	.006	.01
Aromatic olefins										
Indene	11.140	100.00	.048	.43	.043	.39	.005	.04	.003	.03
4-Vinylcyclo-1-hexene	20.820	100.00	.010	.05	.009	.04	.002	.01	.001	.00
Cyclohexene	8.18	100.00	.045	.55	.029	.35	.016	.20	.007	.09
Diolefins										
2,5-Dimethyl-2,4-hexadiene	14.320	100.00	.092	.64	.074	.52	.018	.13	.016	.11
2,5-Dimethyl-1,3-hexadiene	18.950	100.00	.030	.16	.023	.12	.007	.04		
Polycyclics										
Naphthalene blend	34.590	100.00	.083	.18	.047	.14	.016	.05	.022	.06
Sulfur compounds										
Thiophenol	6.230	100.00	4.300	69.02	2.400	38.52	1.900	30.50	.090	1.44
m-Toluenethiol	32.590	100.00	25.700	78.90	13.900	42.67	11.800	36.23	.840	2.58
Sulfide blend	10.680	100.00	.579	5.41	.443	4.14	.136	1.27	.021	.19
Disulfide blend	8.000	100.00	.098	1.22	.075	.94	.023	.28	.017	.21
Isobutylthiophene	19.730	100.00	.047	.23	.036	.18	.011	.05	.009	.04
Thiophene blend	55.910	100.00	.038	.06	.033	.05	.005	.00	.000	.00
Nitrogen compounds										
N-methylpyrrole	56.36	100.00	.195	.34	.137	.24	.059	.10	.285	.50
Basic N blend	65.91	100.00	4.542	6.88	2.951	4.47	1.591	2.41	.879	1.33
Nonbasic N blend	38.68	100.00	1.096	2.83	.736	1.90	.360	.93	.235	.60
Quinoline	39.50	100.00	.127	.33	.089	.22	.045	.11	.027	.06
Oxygenated compounds										
t-Butylhydroperoxide	5.86	100.00	.020	.34	.016	.27	.004	.07	.004	.07

¹ Stored 16 weeks at 43.3 °C (110 °F)

² Microcurie. All $\mu\text{C.}$ values are based on 100 ml sample

Taken from Reference No. 129

TABLE 17

Storage Stability Data, of Unstable Gasoline, With Several Labeled Compounds Added

Labeled compounds added	Storage at 43.3 ° C (110 ° F)					
	0 week		8 weeks		16 weeks	
	Percent reacted ¹	Vapor transfer gum, mg/100 ml	Percent reacted ¹	Vapor transfer gum, mg/100 ml	Percent reacted ¹	Vapor transfer gum, mg/100 ml
Saturates:						
Isotane (H ³)	0.00	44	0.16	79	0.16	65
Isotane (C ¹⁴)	.00	33	.00	56	.00	74
n-Heptane (H ³)	.00	44	.00	83	.00	84
Diolefins:						
3-Heptene (H ³)	.00	37	.05	75	.03	89
1-Hexene (H ³)	.31	41	.40	75	.30	76
1-Octene (C ¹⁴)	.00	37	.00	79	.00	96
Aromatic olefins:						
α-Methylstyrene (H ³)	.17	35	.25	75	.40	76
Styrene (C ¹⁴)	.04	45	—	—	.79	82
Diolefins:						
2,5-Dimethyl-2,4-hexadiene (H ³)	.13	30	.47	83	.66	69
2,5-Dimethyl-1,5-hexadiene (H ³)	.10	32	—	—	.16	83
1,5-Hexadiene (C ¹⁴)	.17	46	.25	60	.40	96
Substituted benzenes:						
Isopropylbenzene (H ³)	.02	43	.31	81	.42	80
Isopropylbenzene (C ¹⁴)	.00	33	.00	55	.00	65
sec-Butylbenzene (H ³)	.03	34	.17	72	.22	69
n-Propyltoluene (C ¹⁴)	.00	33	.00	64	.00	76
Polycyclics:						
2-Methylnaphthalene (H ³)	.00	37	.17	75	.05	70
2-Methylnaphthalene (C ¹⁴)	.74	42	—	—	3.37	82
Naphthalene (C ¹⁴)	.06	33	.07	58	.07	58
Sulfur compounds:						
Thiophenol (H ³)	18.86	41	83.03	78	72.24	71
Thiophenol (S ³⁵)	14.62	33	84.78	72	86.04	101
Cyclohexanethiol (H ³)	.26	46	4.11	63	16.73	88
1-Hexanethiol (S ³⁵)	1.50	44	12.87	73	18.34	61
3-Methyl-1-butanethiol (S ³⁵)	.14	38	9.18	73	18.96	90
2-Pentanethiol (S ³⁵)	.14	50	2.80	80	6.00	84
n-Butyldisulfide (H ³)	.11	131	1.32	52	3.45	87
n-Butyldisulfide (S ³⁵)	.25	57	.20	59	.21	74
n-Butylsulfide (H ³)	.25	88	5.06	70	5.28	98
n-Butylsulfide (S ³⁵)	.08	37	7.05	68	5.11	71
Oxygen compounds:						
Phenol (H ³)	.03	31	.22	37	.93	92
Phenol (C ¹⁴)	1.02	35	—	—	1.76	82

¹On basis of vapor transfer gum only.

TABLE 18
Radioactivity Distribution in Several Types of Gum
In Blend of Very Unstable Gasoline Containing Labeled Compounds, Fresh

Labeled compound	Label	Total Activity ¹ in									
		Storage sample		Vacuum transfer gum		Soluble vacuum transfer gum		Insoluble vacuum transfer gum		Air jet gum	
		$\mu\text{c.}$	Percent	$\mu\text{c.}$	Percent	$\mu\text{c.}$	Percent	$\mu\text{c.}$	Percent	$\mu\text{c.}$	Percent
Olefins											
3-Heptane	H ³	35.590	100.00	0.903	0.08	0.002	0.00	0.000	0.00	0.080	0.00
1-Hexene	H ³	9.860	100.00	.032	.32	.024	.24	.008	.08	.009	.09
1-Octene	C ¹⁴	11.410	100.00	.000	.00	.000	.00	.000	.00	.00	.00
Aromatic olefins											
α -Methylstyrene	H ³	39.770	100.00	.088	.17	.058	.14	.010	.03	.003	.01
Styrene	C ¹⁴	2.520	100.00	.001	.04	.001	.04	.000	.00	.000	.00
Diolenes											
1,5-Hexadiene	C ¹⁴	12.550	100.00	.020	.16	.016	.14	.002	.02	.001	.01
Substituted benzenes											
t-Butylbenzene	H ³	44.270	100.00	.006	.01	.005	.01	.001	.00	.009	.02
sec-Butylbenzene	H ³	35.030	100.00	.008	.02	.008	.02	.000	.00	.003	.01
Isopropylbenzene	H ³	40.640	100.00	.013	.03	.013	.03	.000	.00	.003	.00
n-Propyltoluene	C ¹⁴	1.680	100.00	.000	.00	.000	.00	.000	.00	.000	.00
Isopropylbenzene	C ¹⁴	5.680	100.00	.000	.00	.000	.00	.000	.00	.000	.00
Polycyclics											
Indan	H ³	27.090	100.00	.003	.02	.002	.01	.001	.01	.002	.01
2-Methylnaphthalene	C ¹⁴	4.450	100.00	.033	.74	.029	.65	.004	.09	.007	.16
Naphthalene	C ¹⁴	2.950	100.00	.002	.06	.001	.03	.001	.03	.000	.00
2-Methylnaphthalene	H ³	19.820	100.00	.003	.01	.002	.01	.001	.00	.008	.04
Sulfur compounds											
Sulfide blend	H ³	10.680	100.00	.019	.18	.005	.05	.014	.13	.005	.05
Disulfide blend	H ³	8.080	100.00	.039	.49	.030	.38	.009	.11	.009	.11
Thiophene blend	H ³	55.910	100.00	.010	.02	.006	.01	.005	.01	.021	.04
2-Pentanethiol	S ³⁵	14.910	100.00	.023	.15	.023	.15	.000	.00	.001	.00
3-Methyl-1-butanethiol	S ³⁵	14.410	100.00	.019	.13	.017	.11	.002	.02	.003	.02
1-Hexanethiol	S ³⁵	10.820	100.00	.167	1.54	.167	1.54	.000	.00	.001	.00
Thiophenol	S ³⁵	16.090	100.00	2.167	13.47	2.167	13.47	.000	.00	.588	3.65
n-Butyldisulfide	S ³⁵	16.000	100.00	.021	.13	.021	.13	.000	.00	.001	.00
Nitrogen compounds											
Basic N blend	H ³	65.910	100.00	.240	.37	.150	.23	.090	.14	.074	.11
Nonbasic N blend	H ³	30.680	100.00	.067	.22	.052	.13	.035	.09	.034	.09

Continued on next page

¹Based on 100 ml. sample.

Taken from Reference No. 130

TABLE 18

Radioactivity Distribution in Several Types of Gum
In Blend of Very Unstable Gasoline Containing Labeled Compounds, Stored 8 Weeks at 43.3 °C (110 °F)

Labeled compound	Label	Total Activity ¹ in									
		Storage sample		Vacuum transfer gum		Soluble vacuum transfer gum		Insoluble vacuum transfer gum		Air jet gum	
		μc.	Percent	μc.	Percent	μc.	Percent	μc.	Percent	μc.	Percent
Olefins											
3-Heptene	H ³	35.590	100.00	0.017	0.05	0.011	0.03	0.006	0.02	0.003	0.01
1-Hexene	H ³	9.860	100.00	.035	.35	.032	.32	.003	.03	.004	.04
1-Octene	C ¹⁴	11.410	100.00	.000	.00	.000	.00	.000	.00	.00	.00
Aromatic olefins											
α-Methylstyrene	H ³	39.770	100.00	.193	.49	.193	.49	.000	.00	.004	.01
Styrene	C ¹⁴	2.520	100.00				No Test Run				
Diolefins											
1,5-Hexadiene	C ¹⁴	12.550	100.00	.032	.25	.027	.21	.005	.04	.005	.04
Substituted benzenes											
t-Butylbenzene	H ³	44.270	100.00	.046	.10	.044	.10	.002	.00	.043	.10
sec-Butylbenzene	H ³	35.090	100.00	.070	.20	.070	.20	.000	.00	.003	.01
Isopropylbenzene	H ³	40.640	100.00	.134	.33	.130	.32	.004	.01	.008	.02
n-Propyltoluene	C ¹⁴					No Test Run					
Isopropylbenzene	C ¹⁴	5.680	100.00	.003	.05	.003	.05	.000	.00	.000	.00
Polycyclics											
Indan	H ³	27.090	100.00	.012	.04	.011	.04	.001	.00	.002	.01
2-Methylnaphthalene	C ¹⁴	4.450	100.00				No Test Run				
Naphthalene	C ¹⁴	2.950	100.00	.002	.07	.002	.07	.000	.00	.001	.00
2-Methylnaphthalene	H ³	19.820	100.00	.035	.18	.023	.12	.012	.06	.001	.00
Sulfur compounds											
Sulfide blend	H ³	10.680	100.00	.214	2.00	.155	1.45	.059	.55	.018	.17
Disulfide blend	H ³	8.000	100.00	.089	1.11	.065	.81	.024	.30	.010	.13
Thiophene blend	H ³	55.910	100.00	.032	.08	.028	.05	.006	.01	.005	.00
2-Pentanethiol	S ³⁵	14.910	100.00	.415	2.78	.415	2.78	.000	.00	.016	.11
3-Methyl-1-butanethiol	S ³⁵	14.410	100.00	1.296	8.99	1.120	7.77	.176	1.22	.058	.40
1-Hexanethiol	S ³⁵	10.820	100.00	1.404	12.98	1.404	12.88	.000	.00	.081	.75
Thiophenol	S ³⁵	16.090	100.00	12.584	78.21	11.784	73.24	.800	4.97	.385	2.27
n-Butylsulfide	S ³⁵	16.000	100.00	.025	.18	.019	.12	.006	.04	.002	.01
Nitrogen compounds											
Basic N blend	H ³	65.910	100.00	3.204	4.85	2.506	3.80	.697	1.05	.633	.95
Nonbasic N blend	H ³	38.680	100.00	.708	1.83	.343	.88	.365	.94	.179	.46
										.466	.70
										.497	1.28

Continued on next page

¹Based on 100 ml. sample.

Taken from Reference No. 130

TAB 3

**Radioactivity Distribution in Several Types of Gum
In Blend of Very Unstable Gasoline Containing Labeled Compounds, Stored 16 Weeks at 43.3 °C (110 °F)**

Labeled compound	Label	Total Activity ¹ in									
		Storage sample		Vacuum transfer gum		Soluble vacuum transfer gum		Insoluble vacuum transfer gum		Air jet gum	
		μc.	Percent	μc.	Percent	μc.	Percent	μc.	Percent	μc.	Percent
Olefins											
3-Heptene	H ³	35.590	100.00	0.017	0.05	0.011	0.03	0.006	0.02	0.001	0.00
1-Hexene	H ³	9.660	100.00	.034	.34	.025	.25	.009	.09	.005	.05
1-Octene	C ¹⁴	11.410	100.00	.001	.01	.001	.01	.000	.00	.00	.00
Aromatic olefins											
α-Methylstyrene	H ³	39.770	100.00	.213	.54	.208	.52	.007	.02	.008	.02
Styrene	C ¹⁴	2.520	100.00	.020	.79	.017	.67	.003	.12	.001	.04
Diolefins											
1,5-Hexadiene	C ¹⁴	12.550	100.00	.050	.41	.035	.29	.015	.12	.003	.02
Substituted benzene											
1-Butylbenzene	H ³	44.270	100.00	.061	.13	.058	.13	.003	.00	.006	.01
sec-Butylbenzene	H ³	35.990	100.00	.081	.23	.069	.20	.012	.03	.004	.01
Isopropylbenzene	H ³	40.640	100.00	.170	.41	.156	.38	.014	.03	.018	.04
n-Propylbenzene	C ¹⁴	1.680	100.00	.009	.00	.008	.00	.000	.00	.000	.00
Isopropylbenzene	C ¹⁴	5.680	100.00	.000	.00	.000	.00	.000	.00	.000	.00
Polycyclics											
Indan	H ³	27.090	100.00	.014	.05	.011	.04	.003	.01	.002	.01
2-Methylnaphthalene	C ¹⁴	4.450	100.00	.150	.37	.099	.22	.051	.15	.032	.72
Naphthalene	C ¹⁴	2.950	100.00	.002	.07	.002	.07	.000	.00	.000	.00
2-Methylnaphthalene	H ³	19.820	100.00	.014	.07	.012	.06	.002	.01	.001	.00
Sulfur compounds											
Sulfide blend	H ³	10.680	100.00	.579	5.41	.443	4.14	.136	1.27	.015	.04
Disulfide blend	H ³	8.000	100.00	.098	1.22	.075	.94	.023	.28	.014	.17
Thiophene blend	H ³	55.910	100.00	.838	.07	.833	.06	.005	.01	.000	.00
2-Pentanethiol	S ³⁵	14.910	100.00	.862	5.91	.807	5.41	.075	.50	.056	.38
3-Methyl-1-butanethiol	S ³⁵	14.410	100.00	2.692	18.68	1.715	11.90	.977	6.78	.219	1.52
1-Hexanethiol	S ³⁵	10.820	100.00	1.941	17.94	1.175	10.86	.765	7.08	.143	1.32
Thioethanol	S ³⁵	16.090	100.00	13.980	86.88	9.773	60.74	4.207	26.14	.382	2.37
n-Butyldisulfide	S ³⁵	16.080	100.00	.003	.20	.017	.11	.014	.09	.993	.02
Nitrogen compounds											
Basic N blend	H ³	65.910	100.00	4.542	6.88	2.951	4.47	1.591	2.41	.879	1.33
Nonbasic N blend	H ³	38.688	100.00	1.096	2.83	.796	1.90	.360	.93	.235	.60
										1.552	2.35
										.680	1.78

¹Based on 100 ml. sample.

Taken from Reference No. 130

TABLE 19

Contribution of Types of Fuel Components to Gum Formation in Unstable Gasoline Stored at 43.3 °C (110 °F)

Type compound	Milli-grams in 100 fuel	Percent of compound reacted to gum				Milligrams of compound reacted to gum				Percent of total gum accounted for by compound							
		VT ¹		SOL VT ²		INS VT ³		AJ ⁴		Total VT		SOL VT		INS VT			
		AJ ⁴		SOL VT		INS VT		AJ		Total VT		SOL VT		INS VT			
0 WEEK STORAGE																	
Olefins:																	
Cycloolefins ⁵	6,876	0.10	0.05	0.05	0.00	6.9	3.4	3.4	0.0	19.33	13.23	34.00	0.00				
Aliphatic ⁶	19,200	.11	.08	.03	.03	21.1	15.4	5.8	5.8	59.11	58.93	58.80	70.77				
Diaterfins ⁷	546	.16	.14	.03	.01	.9	.8	.1	.1	2.52	3.11	1.00	1.21				
Polycyclics ⁸	1,661	.21	.18	.03	.06	3.5	3.0	.5	.8	9.80	11.67	5.00	9.75				
Alkylbenzenes ⁹	8,869	.01	.01	.00	.01	.9	.9	.0	.9	2.52	3.50	.00	10.97				
Sulfur compounds:																	
Thiophenol ¹⁰	13	13.47	13.47	.00	3.65	1.8	1.8	.0	.5	5.04	7.00	.00	6.09				
Sulfides ¹¹	125	.18	.05	.13	.05	.2	.1	.2	.1	.56	.39	2.90	1.21				
Disulfides ¹²	16	.49	.38	.11	.11	.1	.1	.0	.0	.28	.39	.00	.00				
Aliphatic thiois ¹²	16	.51	.50	.01	.01	.1	.1	.0	.0	.28	.39	.00	.00				
Thiophenes ¹¹	39	.02	.01	.01	.04	.0	.0	.0	.0	.00	.00	.00	.00				
Nitrogen compounds:																	
Basic ¹¹	23	.37	.23	.14	.11	.1	.1	.0	.0	.28	.39	.00	.00				
Nonbasic ¹¹	23	.72	.13	.09	.09	.1	.0	.0	.0	.28	.00	.00	.00				
Total	---	---	---	---	---	35.7	25.7	10.0	8.2	100.00	100.00	100.00	100.00				
8 WEEKS STORAGE																	
Olefins:																	
Cycloolefins ⁵	8,876	0.49	0.48	0.00	0.01	33.7	33.7	0.0	0.7	36.39	38.42	9.00	8.33				
Aliphatic ⁶	19,200	.13	.12	.02	.02	25.0	23.0	3.8	3.8	27.05	26.27	57.60	48.25				
Diaterfins ⁷	546	.25	.21	.04	.04	1.4	1.1	.2	.2	1.51	1.25	3.03	2.38				
Polycyclics ⁸	1,661	.10	.06	.04	.00	1.7	1.0	.7	.0	1.83	1.14	10.60	.80				
Alkylbenzenes ⁹	8,869	.17	.17	.00	.03	15.1	15.1	.0	2.7	15.30	17.21	.00	32.14				
Sulfur compounds:																	
Thiophenol ¹⁰	13	78.21	73.24	4.97	2.27	10.2	9.5	.5	.3	11.01	10.83	9.09	3.57				
Sulfides ¹¹	125	2.00	1.45	.55	.17	2.5	1.8	.7	.2	2.69	2.05	10.60	2.38				
Disulfides ¹²	16	1.11	.81	.30	.13	.2	.1	.1	.0	.21	.11	1.51	.00				
Aliphatic thiois ¹²	16	8.25	7.84	.41	1.14	1.3	1.3	.1	.2	1.40	1.48	1.51	2.38				
Thiophenes ¹¹	39	.06	.05	.01	.00	.0	.0	.0	.0	.00	.00	.90	.00				
Nitrogen compounds:																	
Basic ¹¹	23	4.85	3.88	1.06	.96	1.1	.9	.2	.2	1.18	1.02	3.03	2.38				
Nonbasic ¹¹	23	1.83	.88	.94	.46	.4	.2	.2	.1	.43	.22	3.03	1.19				
Total	---	---	---	---	---	92.8	87.7	6.8	8.4	100.00	100.00	100.00	100.00				

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Taken from Reference No. 130, 105

TABLE 19

Contribution of Types of Fuel Components to Gum Formation in Unstable Gasoline Stored at 43.3 °C (110 °F) --continued

Type compound	Milli-grams in 100 ml of fuel	Percent of compound reacted to gum				Milligrams of compound reacted to gum				Percent of total gum accounted for by compound			
		Percent of compound reacted to gum		Percent of compound reacted to gum		Milligrams of compound reacted to gum		Milligrams of compound reacted to gum		Percent of total gum accounted for by compound		Percent of total gum accounted for by compound	
		VT ¹	SOL VT ²	INS VT ³	AJ ⁴	Total VT	SOL VT	INS VT	AJ	Total VT	SOL VT	INS VT	AJ
16 WEEK STORAGE													
Olefins:													
Cycloolefins ⁵	6,876	0.67	0.60	0.07	0.03	46.1	41.3	4.8	2.1	37.13	41.07	20.34	19.09
Aliphatic ⁶	19,208	.13	.10	.03	.02	25.0	19.2	5.8	3.8	20.11	19.06	24.57	34.60
Diolefins ⁷	546	.41	.29	.12	.02	2.2	1.6	.7	.1	1.76	1.58	2.97	.90
Polycyclics ⁸	1,661	.89	.60	.29	.18	14.8	10.0	4.8	3.0	11.90	9.93	20.34	27.27
Alkylbenzenes ⁹	8,869	.15	.14	.01	.01	13.3	12.4	.9	.9	10.69	12.31	3.81	8.18
Sulfur compounds:													
Thiophenol ¹⁰	13	86.88	60.74	26.14	2.37	11.3	7.9	3.4	.3	9.09	7.84	14.41	2.72
Sulfides ¹¹	125	5.41	4.14	1.27	.14	6.8	5.2	1.6	.2	5.47	5.16	6.78	1.81
Disulfides ¹¹	16	1.22	.94	.28	.17	.2	.2	.0	.0	.16	.19	.00	.00
Aliphatic thiols ¹²	16	14.18	9.39	4.79	1.07	2.3	1.5	.8	.2	1.85	1.48	3.39	1.81
Thiophenes ¹¹	39	.07	.06	.01	.00	.0	.0	.0	.0	.00	.00	.00	.00
Nitrogen compounds:													
Basic ¹¹	23	6.88	4.47	2.41	1.33	1.6	1.0	.6	.3	1.28	.99	2.54	2.72
Nonbasic ¹¹	23	2.83	1.90	.93	.60	.7	.4	.2	.1	.56	.39	.85	.90
Total	--	--	--	--	--	124.3	100.7	23.6	11.0	100.00	100.00	100.00	100.00

¹Total vapor transfer gum.²Soluble vapor transfer gum.³Insoluble vapor transfer gum.⁴Alt-jet gum.⁵Average of two individual compounds.⁶Average of three compounds.⁷Single compound.⁸Average of four individual compounds.⁹Average of five individual compounds.¹⁰Thiophenol with S³⁵ label.¹¹Determined on blend.¹²Average of three individual compounds.

Taken from Reference No. 130, 105

TABLE 20
Storage tests at 43.3 °C (110 °F) of Labeled Compounds in Synthetic Gasoline

Labeled compound	Label	0 weeks storage				8 weeks storage				16 weeks storage							
		Gum formed, mg/100 ml		Percent reacted to gum		Gum formed, mg/100 ml		Percent reacted to gum		Gum formed, mg/100 ml		Percent reacted to gum					
		VT ¹	FP	VT	FI	VT ¹	FP	VT	FI	VT ¹	FP	VT	FI				
		Total	gum	Total	gum	Total	gum	Total	gum	Total	gum	Total	gum				
Saturated compounds:																	
Isocutane	H ²	131.5	—	0.00	—	0.80	—	135.0	18.9	0.05	0.05	0.10	158.5	20.2	0.00	0.00	0.00
Isocutane	C ¹⁴	131.0	—	.00	—	.00	—	132.8	15.1	.00	.00	.00	138.0	19.3	.00	.00	.00
Methylcyclohexane	H ²	126.1	—	.00	—	.00	—	151.0	19.7	.00	.00	.00	140.5	22.0	.00	.00	.00
Alkylbenzenes:																	
Isopropylbenzene	H ²	131.5	—	.20	—	.28	—	144.0	15.0	.22	.01	.23	123.1	17.1	.20	.01	.21
Isopropylbenzene	C ¹⁴	122.5	—	.00	—	.00	—	138.5	9.7	.08	.00	.00	120.4	16.3	.00	.00	.00
sec-Butylbenzene	H ²	133.5	—	.55	—	.56	—	186.0	17.2	.53	.01	.54	153.0	20.8	.53	.02	.55
sec-Butylbenzene	C ¹⁴	125.9	—	.48	—	.48	—	133.0	17.8	.00	.00	.00	112.9	19.3	.00	.00	.00
Polycyclics:																	
Indan	H ²	145.0	—	.92	—	.92	—	143.4	14.5	1.97	.11	1.78	184.5	18.1	1.86	.13	1.99
2-Methylnaphthalene	H ²	127.3	—	.50	—	.50	—	117.0	22.0	.57	.03	.57	126.4	23.6	.52	.02	.54
2-Methylnaphthalene	C ¹⁴	132.5	—	.00	—	.00	—	156.4	20.2	.24	.00	.24	163.0	23.5	.30	.00	.00
Monolefins:																	
1-Hexene	H ²	(²)	—	.00	—	.00	—	162.7	11.5	.31	.00	.31	137.0	15.3	.31	.07	.38
3-Heptene	H ²	138.0	—	.11	—	.11	—	126.1	19.0	.12	.00	.12	160.1	20.7	.12	.00	.12
3-Heptene	C ¹⁴	133.0	—	.00	—	.00	—	131.0	16.3	.00	.00	.00	212.1	23.1	.00	.00	.00
1-Octene	H ²	122.0	—	.56	—	.58	—	130.0	19.5	.55	.14	.69	135.0	16.0	.54	.03	.64
1-Octene	C ¹⁴	134.5	—	.32	—	.32	—	188.5	18.4	.43	.00	.43	139.1	22.0	.42	.00	.42
Cycloolefins:																	
Cyclohexene	H ²	135.0	—	.55	—	.55	—	146.0	18.3	.53	.14	.67	168.0	23.5	.61	.14	.75
Cyclohexene	C ¹⁴	148.5	—	.00	—	.00	—	154.5	21.4	.15	.00	.15	155.1	24.0	.12	(²)	.12
Diene:																	
1,5-Hexadiene	H ²	115.0	—	.48	—	.46	—	144.0	15.5	.80	.04	.64	128.4	19.4	.56	.07	.63
1,5-Hexadiene	C ¹⁴	128.5	—	.75	—	.75	—	139.5	18.8	1.06	.15	1.21	130.1	23.3	.76	.15	.91
Nitrogen compounds:																	
2-Methylpyridine	H ²	132.1	—	.03	—	.03	—	157.5	14.3	.13	.45	.58	99.5	19.5	.68	.84	.92
Pyrrrole	H ²	115.1	—	.43	—	.43	—	152.0	11.1	3.65	1.41	5.06	134.5	19.5	4.17	4.31	8.48
Olefins:																	
n-Butyldisulfide	H ²	124.8	—	1.18	—	1.18	—	118.5	16.6	3.21	.39	3.60	144.5	16.4	3.67	.76	4.53
n-Butyldisulfide	S ²⁵	119.8	—	.31	—	.31	—	112.5	16.8	.74	.23	.97	125.0	16.7	2.61	.23	3.04
Sulfide:																	
n-Butylsulfide	H ²	71.2	—	3.68	—	3.68	—	158.4	17.1	7.96	(²)	7.96	173.5	20.1	28.09	(²)	26.06
n-Butylsulfide	S ²⁵	126.4	—	7.56	—	7.56	—	140.0	18.0	16.00	.18	16.18	115.5	18.3	1.41	.27	1.68
Mercaptan: 1-Hexanethiol	S ²⁵	128.5	—	11.37	—	11.37	—	134.1	12.3	27.97	2.08	30.03	126.0	20.0	30.57	3.53	34.10
Thiophenol																	
Thiophenol	H ²	182.5	—	93.42	—	93.42	—	177.0	17.5	89.75	2.88	92.25	176.8	29.4	89.01	3.30	2.31
Thiophenol	S ²⁵	139.0	—	82.86	—	82.86	—	163.6	25.5	88.94	1.12	90.06	194.7	36.8	89.16	4.98	94.12
Average																	
		129.0	—	—	—	—	—	145.0	17.1	—	—	—	145.7	20.9	—	—	—

¹Vapor transfer gum.

²Fuel-insoluble gum.

³No data available.

Taken from Reference No. 131, 105

TABLE 21
Compounds And Reactivities in Formation of Gums at 43.3 °C (110 °F).¹

Compound	Label	Wt. % Found In Gum Weeks at 43.3 °C (110 °F).			
		0	8	16	
Thiophenol	S ³⁵	82.86	90.06	94.12	
1-Hexanethiol	S ³⁵	11.37	30.03	34.10	
n-Butylsulfide	H ³	3.68	7.96	26.09	
Pyrrrole	H ³	.43	5.06	8.48	
n-Butyldisulfide	S ³⁵	.31	.97	3.04	
Indan	H ³	.92	1.78	1.99	
2-Methylpyridine	H ³	.03	.58	.92	
1,5-Hexadiene	C ¹⁴	.75	1.21	.91	
1-Octene	C ¹⁴	.32	.43	.42	
1-Hexene	H ³	.08	.31	.38	
Cyclohexene	C ¹⁴	.00	.15	.12	
2-Methylnaphthalene	C ¹⁴	.00	-	.00	
sec-Butylbenzene	C ¹⁴	-	.60	.00	
Isopropylbenzene	C ¹⁴	.00	.00	.00	
3-Heptene	C ¹⁴	.00	.00	.00	
Methylcyclohexane	H ³	.00	.00	.00	
Isoclane	C ¹⁴	.00	.00	.00	

¹Includes both vacuum transfer and fuel-insoluble gum.

Taken from Reference No. 131 and 105

TABLE 22
Storage Data for Gasolines at 43.3 °C (110 °F)

Sample Description	Storage Time	Water, ppm	Vapor transfer gum, mg/100 ml	Air jet gum, mg/100 ml	O ₂ % in outage
"Regular" gasoline	0	185	21.7	1.5	20.8
	1 day		19.3	3.0	20.8
	1 week		19.0	1.6	20.8
	3 week		22.3	2.1	19.8
	8 week		48.9	5.6	13.8
	16 week		85.3	10.5	3.9
	32 week		-	15.9	0
"Premium" gasoline	0	110	14.4	1.1	20.7
	1 day		13.0	2.6	20.9
	1 week		14.5	3.0	21.0
	3 week		19.1	2.2	20.2
	8 week		19.3	2.0	19.5
	16 week		24.3	2.5	18.3
	32 week		-	2.3	17.0
Reformate 52.9% aromatic	0	168	47.9	0.6	21.1
	1 day		47.5	2.0	21.0
	1 week		45.7	1.6	21.0
	3 week		71.3	1.0	21.4
	8 week		82.8	1.5	21.1
	16 week		47.5	2.8	21.0
	32 week		-	.9	21.0
1 st poly stock 94.3% olefin	0	121	4.9	0.6	21.0
	1 day		5.2	1.2	15.0
	1 week		11.9	1.0	1.9
	3 week		8.3	0.5	4.5
	8 week		11.4	0.4	1.0
	16 week		8.5	1.8	2.0
	32 week		-	.5	-
Cat.Cr. stock	0	139	15.0	1.0	20.9
	1 day		13.6	1.2	21.0
	1 week		13.1	1.4	21.0
	3 week		17.0	1.8	19.5
	8 week		25.4	4.5	18.6
	16 week		36.1	3.2	13.1
	32 week		-	9.2	15.0

Table 22 continued on next page

Taken from Reference No. 100

TABLE 22
Storage Data for Gasolines at 43.3 °C (110 °F) -- continued

Sample Description	Storage Time	Water, ppm	Vapor transfer gum, mg/100 ml	Air jet gum, mg/100 ml	O ₂ % in outage
Alkylate	0	76	35.2	0.0	20.9
	1 day		26.5	0.0	21.0
	1 week		39.9	0.0	21.0
	3 week		38.9	0.8	21.0
	8 week		46.3	0.0	21.0
	16 week		54.8	1.0	21.0
	32 week		-	0	21.0
Av Gas Blending stock	0	248	24.0	1.0	21.0
	1 day		23.3	1.3	21.0
	1 week		18.3	1.3	21.0
	3 week		22.6	1.6	21.1
	8 week		28.0	2.6	21.0
	16 week		98.9	5.4	10.9
	32 week		-	6.0	10.0
Thermal cracked stock 37.9% olefin	0	116	45.0	1.7	21.0
	1 day		42.0	3.6	21.0
	1 week		48.0	3.2	20.2
	3 week		72.5	9.1	15.7
	8 week		130.5	13.3	0.7
	16 week		115(?)	13.7	1.0
	32 week		-	13.1	0
"Regular" gasoline	0	149	-	-	21.0
	1 day		36.3	1.2	20.7
	1 week		72.1	2.4	19.7
	3 week		56.2	1.0	17.5
	8 week		70.0	3.8	15.6
	16 week		102.0	6.3	0
	32 week		-	9.3	0
Cat poly stock 81.5% olefin	0		-	-	21.0
	1 day		45.4	3.1	21.0
	1 week		41.5	4.0	0
	3 week		28.5	2.3	0
	8 week		32.9	2.7	0
	16 week		34.5	3.4	0
	32 week		-	-	0

en from Reference No. 100

TABLE 23

Comparison of Storage at 43.3 °C (110 °F) and Bomb Test at 121.1 °C (250 °F) for Gasolines¹

Compan...

Sample Number	110 ° F Storage - weeks										Bomb hrs at 250 ° F										
	0			3			8			16			4			8			16		
	1	2		1	2		1	2		1	2		1	2		1	2		1	2	
Regular Gasoline	1.5	2.3		2.1	4.3		5.6	5.3		10.5 ²	11.7 ²		15.9 ²	—		6.2	6.2		11.4	11.8	
Premium Gasoline	1.1	—		2.2	3.5		2.0	—		2.5	—		2.3	—		2.5	2.8		7.3	6.7	
Cat. Cracked Stock	1.0	2.5		1.8	2.2		4.5	4.3		2.4 ³	6.5		9.2	—		5.2	7.4		10.0	12.2	
Alk. Blending Stock	0	—		.8	.2		0	0		0	0		0	—		0	6.1		0	0	
Av. Gas Blending Stock	1.0	2.1		1.6	4.8		4.1	3.6		5.4	2.4		5.0	—		5.3	19.2		7.8	9.9	
Thermal Cracked	1.7	5.2		2.6 ³	9.1		13.3	13.8		13.9	16.4 ³		13.1	—		20.2	7.0		20.0	19.7	
Regular Gasoline	1.8	1.0		1.0	3.9		3.6	4.4		—	8.5		9.3	—		6.0	—		8.2	9.5	

Average	110 ° F Storage - weeks										Bomb hrs at 250 ° F										
	0			3			8			16			4			8			16		
	mg/ 100 ml	% O ₂ Out- age		mg/ 100 ml	% O ₂ Out- age		mg/ 100 ml	% O ₂ Out- age		mg/ 100 ml	% O ₂ Out- age		mg/ 100 ml	% O ₂ Out- age		mg/ 100 ml	% O ₂ Out- age		mg/ 100 ml	% O ₂ Out- age	
Regular Gasoline	1.9	21		3.2	20		5.4	14		11.1 ²	4		15.9 ²	0		6.2	8		11.6	0	
Premium Gasoline	1.1	21		2.8	20		2.0	20		2.5	18		2.3	17		2.7	18		7.0	4	
Cat. Cracked Stock	1.8	21		2.0	20		4.4	19		6.5	13		9.2	15		6.3	5		11.1	0	
Alk. Blending Stock	0	21		.6	21		0	21		0	21		0	7		0	20		0	16	
Av Gas Blending Stock	1.6	21		3.2	21		3.9	21		3.9	10		5.0	9		5.7	17		8.9	5	
Thermal Cracked	3.5	21		9.1	16		13.1	1		13.9	1		13.1	0		19.7	2		19.9	0	
Regular Gasoline	1.4	21		2.5	18		4.0	16		8.5	0		9.3	0		6.5	5		8.9	0	

¹Insoluble gum plus air jet gum in mg/100 ml.²Heavy adherent gum.³Not used in average.

Taken from Reference No. 101

TABLE 24
Hydroperoxide Values for Military and Commercial Gasolines Exposed at 150 ° C

Fuel Evaluated	Initial Value	After 1 week	After 2 weeks	After 3 weeks	After 4 weeks	After 5 weeks	After 6 weeks
Military Fuels							
VV-G-109, gasoline, unleaded	0.07	19.11	49.89	69.68	54.17	42.20	33.73
MIL-G-3056B, gasoline, Combat	0.00	0.35	1.00	2.81	12.85	15.74	14.92
VV-G-76, gasoline, regular	0.12	0.35	0.73	1.05	2.44	2.86	10.19
MIL-J-5624F, jet fuel, JP-4	0.00	0.15	0.18	0.20	0.20	0.10	0.15
MIL-F-45121, fuel, C.I.T.E.	0.10	0.40	0.45	0.35	0.35	0.25	0.22
MIL-G-5572C, gasoline, aviation	0.00	0.00	0.00	0.20	1.29	2.49	2.89
Commercial gasolines							
Premium grade D	0.10	44.66	20.72	6.53	2.30	1.45	1.05
Premium grade C	0.15	1.81	6.15	49.05	26.52	16.10	10.40
Regular grade B	0.20	1.68	4.49	9.73	13.15	26.49	22.39
Regular grade A	0.21	0.67	3.11	35.05	19.05	12.30	9.45
Premium grade A	0.15	0.71	3.17	49.48	27.06	14.91	5.60
Premium grade B	0.05	0.09	1.07	1.84	3.06	48.06	24.55

Taken from Reference No. 68

Comparison of Gum Formation of Gasolines in Sealed Storage and with Air Replenishment

Storage period at 43.3 ° C (110° F)

Sample ¹	0 weeks			3 weeks			8 weeks			16 weeks			32 weeks		
	Gum, mg/100ml	O ₂ , pct		Gum, mg/100 ml	O ₂ , pct		Gum, mg/100 ml	O ₂ , pct		Gum, mg/100 ml	O ₂ , pct		Gum, mg/100 ml	O ₂ , pct	
Regular Gasoline Sealed ²	1.9	21		3.2	20		5.4	14		11.1	4		15.9	0	
Air replenished ³	1.9	21		4.1	20		6.4	19		13.7	19		37.8	13	
Premium Gasoline Sealed ²	1.1	21		2.8	20		2.0	20		2.5	18		2.3	17	
Air replenished ³	1.1	21		2.2	21		1.3	20		2.4	20		5.9	20	
Cal. Cracked Stock Sealed ²	1.8	21		2.0	20		4.4	19		6.5	13		9.2	15	
Air replenished ³	1.8	-		2.1	20		6.3	21		6.3	19		25.7	15	
Alkylate Sealed ²	0	21		.6	21		0	21		0	21		0	7	
Air replenished ³	0	-		0	21		.3	21		.2	20		.8	20	
Av. Gas Blending Stock Sealed ²	1.6	21		3.2	21		3.9	21		3.9	10		5.0	9	
Air replenished ³	1.6	-		3.3	21		1.3	21		3.1	20		7.7	17	
Ther. Cracked Stock Sealed ²	3.5	21		9.1	16		13.1	1		13.9	1		13.1	0	
Air replenished ³	3.5	-		40.2	10		54.3	10		123.8	0		401.0	0	
Regular Gasoline Sealed ²	1.4	21		2.5	18		4.0	16		8.5	0		9.3	0	
Air replenished ³	1.4	21		6.5	19		6.5	17		16.7	14		105.8	7	
Alkylate Sealed ²	0	21		.6	21		0	21		0	21		0	7	
Air replenished ³	0	21		.6	21		-	-		1.6	20		1.9	20	

¹Full boiling-range gasolines or blending stocks

²Averages of two tests.

³Averages of duplicate determination of each of two bottles.

Taken from Reference No. 102, 3, 104

Data from 43.3 ° C (110° F) Storage Tests of Gasolines Containing Additives, mg/100 ml

Fuel ¹	TEL ²	Di- methyl phenyl ³	Initial			3-week test			8-week test			16-week test			32-week test		
			Total outage,		O ₂ in pct	Inor-		Fuel-	Inor-		Fuel-	Inor-		Fuel-	Inor-		Fuel-
			gum	soluble		gum	residue		gum	residue		gum	residue		gum	residue	
A			1.9	3.7	2.0	4.1	0.4	0.8	5.6	6.4	19	11.8	13.7	19	32.6	37.8	13
B			1.1	1.8	2.2	2.2	0.4	0.3	1.1	1.4	20	1.8	2.4	20	2.3	5.9	20
C			1.4	6.0	6.5	19	0.5	0.5	6.0	6.5	16	15.7	16.7	13	3.7	106	7
D			0	2	2.1	0.5	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
A	X		2.4	9.0	16	8.6	0.2	2.5	16.4	18.9	18	20.1	23.5	18	2.3	25.3	20
B	X		1.1	5.4	10	5.8	0	1.7	10.3	12.0	16	13.4	15.9	16	6.8	16.9	20
C	X		3.2	10.7	14	11.6	3.9	1.5	17.4	18.9	12	37.9	40.0	0	13.7	111.6	4
D	X		1.0	1.5	2.0	1.8	0	0.9	2	1.1	21	4.2	5.5	5	42.1	44.2	0
A	X	X	2.0	2.5	2.9	2.9	0	1.3	6.2	7.5	18	20.2	26.0	14	3.6	25.2	20
B	X	X	1.3	1.9	2.2	2.2	0	0.7	2.9	3.6	19	3.3	5.2	16	21.0	24.9	20
C	X	X	2.0	9.3	10.1	10.1	3.2	0.8	16.3	17.1	18	9.1	30.8	0	26.7	87.2	8
D	X	X	2	1.1	1.5	1.5	0	0.9	0.5	1.5	21	1.0	1.8	16	0	2.1	21
A	X		1.6	2.6	3.1	3.1	0	0.9	14.6	15.5	19	2.2	21.4	18	4.6	22.7	20
B	X	X	1.1	1.7	2.0	2.0	0	1.1	7.6	8.7	16	7.1	10.3	17	7.6	17.2	21
C	X	X	2.5	8.9	9.6	9.6	3.2	1.1	15.9	17.0	17	10.1	32.2	0	10.0	116	5
D	X	X	3	1.2	1.6	1.6	0	1.0	1.2	2.2	21	0	1.4	19	1.2	1.6	21
A	X		2.1	1.0	1.5	1.5	0	1.0	3.2	4.2	21	3	5.6	21	1.7	5.8	21
B	X	X	1.4	1.3	1.7	1.7	0	1.0	2.3	3.3	21	2	3.3	21	1.7	3.7	21
C	X	X	2.1	2.8	3.2	3.2	0	0.4	3.9	4.3	21	1.1	9.9	21	1.6	10.9	20
D	X	X	9	7	1.1	1.1	0	0.9	1.2	2.1	21	2	1.8	20	1.2	1.2	21
A	X		2.3	3.1	3.5	3.5	0	1.2	5.7	6.9	19	4.3	14.0	18	4.8	30.3	16
B	X	X	1.5	2.6	2.9	2.9	0	1.1	2.1	3.2	21	1	3.5	21	1.8	2.9	21
C	X	X	1.9	5.1	5.5	5.5	0	0.4	4.9	5.3	19	0	8.8	19	2.9	38.1	0
D	X	X	8	1.8	2.3	2.3	0	0.9	0.9	1.8	18	0	9	21	1.3	1.5	21

Full boiling-range gasolines or blending stocks

A: Regular Gasoline

B: Premium Gasoline

C: Regular Gasoline

D: Alkylate Blending Stock

20Uninhibited Tetraethyllead Motor Mix, 3 ml/gal of gasoline

30B-Di-sec-butyl-p-phenylenediamine, 10 lb/1,000 bbl of gasoline

42,6-Di-tert-butyl-4-methylphenol, 10 lb/1,000 bbl of gasoline

Taken from Reference No. 95, 3, and 104

TABLE 27

Data from Rapid Stability Tests at 93.3 ° C (200° F) of Gasolines Containing Additives, mg/100 ml

Fuel ¹⁾	Additive	Initial			8-hour test				16-hour test						
		Total		O ₂ in outage, pct	Fuel-		Inorganic residue	Insoluble gum	Soluble		Inorganic residue	Insoluble gum	Total		
		gum	pct		gum	pct			gum	pct			gum	pct	
A		1.9	21		1.5	5.7			7.2	19		2.9	9.9	12.8	11
B		1.1	21		1.2	3.1			4.3	19		--	--	4.2	18
C		1.4	21		.8	2.7			3.5	20		1.7	11.7	13.4	7
D		0	21		.5	3.8			4.3	21		.2	.9	1.1	21
A	X	2.4	21		1.5	11.0	0		12.5	16	10.3	2.0	16.0	18.0	9
B	X	1.1	21		1.6	9.3	0		10.9	18	5.8	5.2	11.7	16.9	10
C	X	3.2	21		2.3	13.2	1.3		15.5	10	4.3	1.9	16.2	18.1	1
D	X	1.0	21		3.1	2.1	3.1		6.3	20	12.9	2.4	4.7	7.1	0
A	X	2.9	21		1.0	9.5	0		10.5	17	3.4	3.6	30.3	33.9	4
B	X	1.3	21		1.1	8.9	2.2		10.0	18	1.4	3.2	13.0	16.2	10
C	X	1.7	21		2.9	11.7	0		14.6	15	4.2	1.2	19.7	20.9	0
D	X	.2	21		1.4	1.4	0		2.8	20	.1	1.6	3.6	5.2	19
A	X	1.6	21		1.0	4.4	0		5.2	17	8.8	2.2	16.2	18.4	9
B	X	1.2	21		2.9	3.0	0		5.9	21	3.8	1.8	9.8	11.6	12
C	X	2.5	21		2.4	11.5	0		13.9	19	5.2	1.5	17.7	19.2	0
D	X	.3	21		3.8	1.1	0		4.9	20	0	.9	1.1	2.0	19
A	X	2.1	21		1.6	10.3	0		11.9	21	0	2.5	8.0	10.5	21
B	X	1.4	21		3.0	2.9	0		5.9	20	0	1.7	3.4	5.1	20
C	X	2.1	21		1.9	8.4	0		10.3	15	0	.8	8.7	9.5	18
D	X	.9	21		2.2	1.7	0		3.9	17	0	1.0	.8	1.6	20
A	X	2.3	21		1.3	4.1	0		5.4	21	2.2	3.0	15.2	18.2	20
B	X	1.5	21		1.6	3.3	0		4.9	20	0	1.8	3.8	5.6	19
C	X	1.9	21		1.1	4.0	0		5.1	20	0	1.1	8.9	10.0	17
D	X	.8	21		2.7	1.5	0		4.2	19	0	.3	.7	1.0	19

¹Full boiling range gasolines or blending stocks

A: Regular Gasoline

B: Premium Gasoline

C: Regular Gasoline

D: Alkylate Blending Stock

²Uninhibited tetraethyllead motor mix, 3 ml/gal of fuel.³N,N-di-sec-butyl-p-phenylenediamine, 10 lb/1,000 bbl of fuel.⁴2,6-Di-tert-butyl-4-methylphenol, 10 lb/1,000 bbl of fuel.

Taken from Reference No. 96, 3, and 104

TABLE 28
Gum Correlation for Neat Fuels

Sample Description	F ¹	Total Gum in 43.3 °C (110 °F) Storage											
		3 Weeks				8 Weeks				16 Weeks			
		Det. ²	Pred. ³	Dev. ⁴	Det.	Pred.	Dev.	Det.	Pred.	Det.	Pred.	Dev.	Dev.
Regular gasoline	1.16	4.1	3.6	0.5	6.4	6.0	0.2	13.7	11.1	37.8	36.6	1.2	
Premium gasoline	.23	2.2	.4	1.8	1.4	1.0	.4	2.4	.19	5.9	5.0	.9	
Regular gasoline	1.91	6.5	8.4	1.9	5.5	13.3	6.8	16.7	20.9	106	124	18	
Alkylate blending stock	.05	.6	.2	.4	—	.4	—	1.6	.5	1.9	.8	1.1	
Cal. C. blending stock	1.05	2.1	3.0	.9	6.3	5.7	.6	6.4	9.8	25.7	31.0	5.3	
Alkylate blending stock	0.8	0	.2	.2	.3	.5	.2	.2	.6	.7	1.0	.3	
AvGas blending stock	.53	3.3	1.0	2.3	1.3	2.5	1.2	3.1	4.4	7.7	12.3	4.6	

¹ F = $\frac{\text{mg total gum, 16 hrs. at 200 °F}}{\% \text{ O}_2, 16 \text{ hrs. at 200 °F}}$

² Determined, mg / 100 ml

³ Predicted mg / 100 ml, using graph in Reference 3.

⁴ Deviation, mg / 100 ml

Taken from Reference No. 96 and 3

TABLE 29
Gum Correlation for Fuels with Antioxidants

Sample	F ¹	Total Gum in 43.3 ° C (110 ° F) Storage											
		3 Weeks				8 Weeks				16 Weeks			
		Det. ²	Pred. ³	Dev. ⁴	Det.	Pred.	Dev.	Det.	Pred.	Dev.	Det.	Pred.	Dev.
Reg. Gasoline + D ⁵	0.50	1.5	0.9	0.6	4.2	2.4	1.8	5.6	4.1	1.5	7.5	11.4	3.9
Prem. Gasoline + D ⁵	.26	1.7	.4	1.3	3.3	1.2	2.1	3.3	2.1	1.2	5.4	5.6	.2
Reg. Gasoline + D ⁵	.53	3.2	1.0	2.2	4.3	2.5	1.8	4.9	4.4	.5	12.5	12.3	.2
Alk. Blending Stock + D ⁵	.08	1.1	.2	.9	2.1	.5	1.6	1.8	.6	1.2	1.2	1.0	.2
Reg. Gasoline + P ⁶	.91	3.5	2.3	1.2	6.9	4.8	2.1	14.0	8.2	5.8	35.1	24.8	10.3
Prem. Gasoline + P ⁶	.29	2.9	.5	2.4	3.2	1.4	1.8	3.5	2.4	1.1	4.7	6.3	1.6
Reg. Gasoline + P ⁶	.59	5.6	1.2	4.4	5.3	2.8	2.5	8.8	5.0	3.8	41.0	14.0	27.0
Alk. Blending Stock + P ⁶	.05	2.3	.2	2.1	1.8	.4	1.4	.9	.5	.4	1.5	.8	.7

¹ F = $\frac{\text{mg total gum, 16 hrs. at 200 ° F}}{\text{mg total gum, 16 hrs. at 200 ° F}}$

² Determined, mg / 100 ml

³ Predicted, mg / 100 ml, using graph in Reference 3

⁴ Deviation, mg / 100 ml

⁵ Diamine antioxidant

⁶ Phenol antioxidant

Taken from Reference No. 96 and 3

TABLE 30

Gum Correlation for Leaded Fuels

Sample	F_8^1	F_{16}^2	Total Gum in 43.3 °C (110 °F) Storage											
			3 Weeks				8 Weeks				16 Weeks			
			Det. ³	Pred. ⁴	Dev. ⁵	Det.	Pred.	Dev.	Det.	Pred.	Dev.	Det.	Pred.	Dev.
Reg. Gas. + TEL	0.78	2.0	9.6	7.9	1.7	18.9	15.1	3.8	23.5	16.0	7.5	27.6	30.0	2.4
Prem. Gas. + TEL	.60	1.7	5.8	6.3	.5	12.0	12.5	.5	15.9	14.0	1.9	23.5	26.0	2.5
Reg. Gas. + TEL	1.55	18.1	11.6	12.9	1.3	18.9	23.0	4.1	40.0	34.5	5.5	125	122	3
Alk. Bl. Stock - TEL	.26	7.1	2.0	3.0	1.0	1.1	6.8	5.7	5.5	30.4	24.9	86.3	80.2	6.1
Reg. Gas. + TEL + D ⁶	.62	8.5	2.9	6.4	3.5	7.5	12.8	5.3	26.0	32.3	6.3	28.8	89.0	60.2
Prem. Gas. + TEL + D ⁶	.53	1.6	2.2	5.7	3.5	3.6	11.5	7.9	5.2	13.0	7.8	24.9	24.2	.7
Reg. Gas. + TEL + D ⁶	.97	20.9	10.1	9.3	.8	17.1	17.4	.3	30.8	34.0	4.2	97.0	127	30
Alk. Bl. Stock + TEL + D ⁶	.14	.3	1.5	1.7	.2	1.5	4.0	2.5	1.8	3.0	1.2	2.1	5.6	3.5
Reg. Gas. + TEL + P ⁷	.31	2.0	3.1	3.6	.5	15.5	7.8	7.7	21.4	16.0	5.4	27.3	30.0	2.7
Prem. Gas. + TEL + P ⁷	.28	1.0	2.0	3.3	1.3	8.7	7.2	1.5	12.7	9.0	3.7	24.8	16.0	8.8
Reg. Gas. + TEL + P ⁷	.73	19.2	9.6	7.5	2.1	17.0	14.4	2.6	34.0	35.0	1.0	116	124	8
Alk. Bl. Stock + TEL + P ⁷	.25	.1	1.6	3.0	1.4	2.2	6.5	4.3	1.4	1.6	.2	1.6	2.5	.9

$$^2 F_8 = \frac{\text{mg total gum, 8 hrs. at } 200^\circ \text{F}}{\% \text{ O}_2, 8 \text{ hrs. at } 200^\circ \text{F}}$$

$$^2 F_{16} = \frac{\text{mg total gum, 16 hrs. at } 200^\circ \text{F}}{\% \text{ O}_2, 16 \text{ hrs. at } 200^\circ \text{F}}$$

³ Determined, mg / 100 ml

⁴ Predicted, mg / 100 ml, using graph in Reference 3

⁵ Deviation, mg / 100 ml

⁶ Diamine antioxidant

⁷ Phenol antioxidant

Taken from Reference No. 96 and 3

TABLE 31

Inorganic Residue Correlation for Two Different Test Conditions

Sample	Inorganic residue, 16 hr., 93.3 °C (200 °F)	Inorganic Residue in 43.3 °C (110 °F) Storage											
		3 Weeks				8 Weeks				16 Weeks			
		Det. ¹	Pred. ²	Dev. ³	Det.	Pred.	Dev.	Det.	Pred.	Dev.	Det.	Pred.	Dev.
Reg. Gas. + TEL	10.3	0	0	0	0.2	0	.2	1.6	15.3	13.7	32.2	36.3	4.1
Prem. Gas. + TEL	5.8	.1	0	.1	0	0	0	5.2	11.0	5.8	24.2	32.5	8.3
Reg. Gas. + TEL	4.3	0	0	0	3.9	0	3.9	10.8	9.1	1.7	29.0	29.6	.6
Alk. Bl. Stock + TEL	12.9	0	0	0	0	0	0	13.2	16.6	3.4	21.7	37.2	15.5
Reg. Gas. + TEL + D ⁴	3.4	0	0	0	.1	0	.1	4.8	7.6	2.8	41.3	19.4	21.9
Prem. Gas. + TEL + D ⁴	1.4	0	0	0	0	0	0	.3	3.6	3.3	21.0	13.0	8.0
Reg. Gas. + TEL + D ⁴	4.2	0	0	0	3.2	0	3.2	9.1	8.9	.2	26.7	29.2	2.5
Alk. Bl. Stock + TEL + D ⁴	.1	0	0	0	0	0	0	0	0	0	0	0	0
Reg. Gas. + TEL + P ⁵	8.8	0	0	0	0	0	0	14.1	14.1	0	34.1	35.6	1.5
Prem. Gas. + TEL + P ⁵	3.8	0	0	0	0	0	0	7.1	8.3	1.2	27.5	27.2	.3
Reg. Gas. + TEL + P ⁵	5.2	0	0	0	3.2	0	3.2	10.1	10.4	.3	35.6	31.7	3.9
Alk. Bl. Stock + TEL + P ⁵	0	0	0	0	0	0	0	0	0	0	0	0	0

¹ Determined, mg / 100 ml² Predicted, mg / 100 ml, using graph in Reference 3³ Deviation, mg / 100 ml⁴ Diamine antioxidant⁵ Phenol antioxidant

Taken from Reference No. 96 and 3