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FUEL OIL

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The present invention relates to fuel oils hav-
ing improved combustion characteristics. The
invention especially relates to heavy or residual
fuel oils, the combustion properties of which are
improved by the incorporation of addition agents
selected from the class of oil-soluble metallic
soaps. The invention especially relates to im-
proved fuels having A. P. I. gravities in the range
from 1° to 15° and having furol viscosities at
122° F. in the range from 25 to 300.

It is well known in the art to prepare various
commercial fuel oils, the inspections of which
vary widely. These fuels are secured from vari-
ous crudes and are processed in a manner to
secure a desired fuel for a particular use. For
example, it is well known in the art to prepare
heavy fuel oils, as for example, bunker fuels or
residual fuels having gravities in the range from
1° to 15° A. P. I. and furol viscosities of from
25 to 300 seconds at 122° F. These heavy or
residual fuels are usually burned with commer-
cial burners in boilers or other fired apparatus,
as for example, in stationary and marine boilers.
These fuels have not been entirely satisfactory
due to the fact that considerable care must be
exercised in order to insure complete combustion
of the fuel. When incomplete combustion oc-
curs, small particles of solid unburned carbona-
ceous material may pass through the flame and
be deposited on the surfaces of the boilers or
apparatus, or may be carried by the gaseous
products of combustion to the atmosphere.
Some fuels, particularly the heavy fuels, as for
example, bunker fuels or residual fuels, are worse
offenders in this respect than others. For ex-
ample, it has been noted that when fuels of this
character are employed in Scotch marine boilers,
the percentage of unburned carbonaceous mate-
rial is at times unduly high. This is very ob-
jectionable, since heating value is lost due to the
incomplete combustion of the fuel, thus increas-
ing the cost of the particular operation. It is
also very objectionable since these unburned car-
bonaceous materials accumulate on heating sur-
faces and render the same inefficient. Further-
more, when this situation exists, it is likely that
the unburned carbonaceous materials will be
carried out through the stack and will deposit
in the surrounding area with deleterious results.

The present invention is directed to improved
fuel oil compositions which may be readily burned
without the formation of undue unburned car-
bonaceous materials. The improved fuels of the
present invention are secured by adding to a
fuel a small quantity of an addition agent se-

lected from the class of oil-soluble metallic soaps.

The preferred soaps are the naphthenates, as
for example, sodium, cadmium, manganese, cal-
cium and zinc naphthenate. Cobalt naphthenate
and iron naphthenate have been found to be
particularly effective. Although the naph-
thenates are preferred, other oil-soluble soaps,
as for example, the oleates and stearates of these
metals, are also effective. The chlorinated fatty
soaps, as for example, calcium chlorinated stear-
ate are also suitable. The preferred soaps are
those which will not raise the viscosity of the
fuel oil and which will not degrade any of the
other properties.

These addition agents may be added at any
time prior to combustion and in any concentra-
tion desirable, depending upon the particular type
of fuel oil being used and also depending upon
the conditions under which the fuel oil is to be
burned. In general, it is preferred to add from
0.1% to 3% by weight of the oil-soluble soap.
For example, when utilizing lead or iron naph-
thenates in bunker or residual fuels, it is pre-
ferred to add from about 0.2% to 2%. In gen-
eral, the weight of the metal added should range
from about .02% to .1%, preferably from about
.05% to .1%.

Although the addition agents of the present
invention may be added to any fuel oil, they
are especially adapted for use in conjunction
with residual or bunker fuels. These fuels have
gravities in the range from 1° to 15° A. P. I. and
furol viscosities at 122° F. in the range from 25
seconds to 300 seconds.

In order to more fully illustrate the present
invention, the following example is given.

Example 1

An unblended fuel oil having a gravity of 11°
A. P. I. and a furol viscosity of about 100 seconds
at 122° F. was fired in a commercial boiler, using
a commercial pressure atomizing burner in a
manner to maintain the following conditions:

Viscosity at atomizer-----	150 seconds Saybolt	
	Universal.	45
Pressure at atomizer-----	125 lbs. per sq. in.	
Excess air-----	25%	
Rate of heat liberation-----	45,000 B. t. u. per	
	hr. cu. ft. of com-	
	bustion chamber.	50

A measured quantity of fuel was burned and the
deposition of unburned carbonaceous material
formed on the heating surfaces was collected
and weighed. Samples of the stack gases were
withdrawn through a sampling line, the velocity

in which was maintained equal to that in the stack so that the material being carried up the stack could be collected in a filter and weighed. Blended fuels containing various addition agents were burned under identical conditions with the following results:

10	Weight percent naphthenate added	Weight percent metal added as naphthenate	Unburned carbonaceous material (In percent of that formed when burning unblended fuel)	
			Stack	Total (inc. tubes)
15			Percent	Percent
Unblended fuel.....	0	0	62.6	100.0
+Zinc naphthenate...	0.58	.047	68.0	94.3
+Lead naphthenate...	0.32	.078	46.8	83.8
+Copper naphthenate.....	1.03	.062	45.7	79.5
20 +Manganese naphthenate.....	1.27	.076	38.4	68.0
+Cobalt naphthenate.....	1.23	.074	32.6	67.4
+Iron naphthenate.....	1.13	.068	29.5	62.6

25 From the above data it may be readily seen that the fuel compositions of the present invention were considerably improved in that the

amount of unburned combustion material was decreased by 10% to 40%.

The present invention is not to be limited by any theory or mode of operation, but only by the following claims in which it is desired to claim all novelty insofar as the prior art permits.

We claim:

1. A liquid fuel oil composition adapted to be burned by means of oil burners at substantially atmospheric pressure having improved combustion characteristics, comprising a heavy fuel oil substantially free of suspended solid particles, having a gravity in the range from about 1° to 15° A. P. I. and containing from about 0.1% to 3% of an addition agent selected from the class of oil-soluble naphthenates of the group consisting of iron, cobalt, and manganese naphthenates.

2. A liquid fuel oil composition adapted to be burned by means of oil burners at substantially atmospheric pressure having improved combustion properties, comprising a heavy fuel oil substantially free of suspended solid particles, having a gravity in the range from about 1° to 15° A. P. I. and containing from about 0.5% to 3% of iron naphthenate.

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