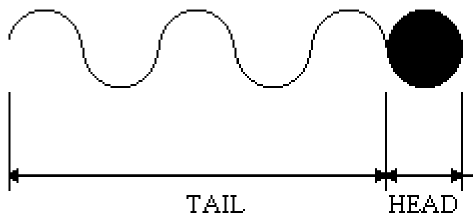
SECTION 1
Surface Active Agent

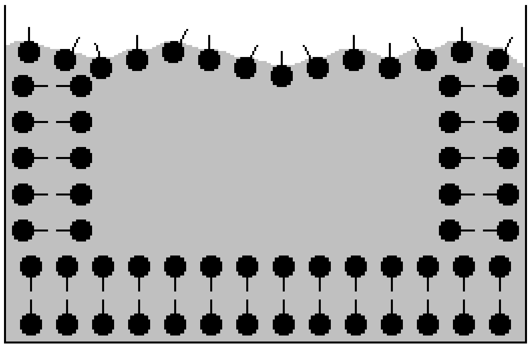
1.1 MOLECULAR STRUCTURE

The molecular structure of a surface active agent is shown below: Usually, the tail will be hydrophobic (incompatible with water) while the head will either be ionic or polar and is said to be hydrophilic (compatible with water).



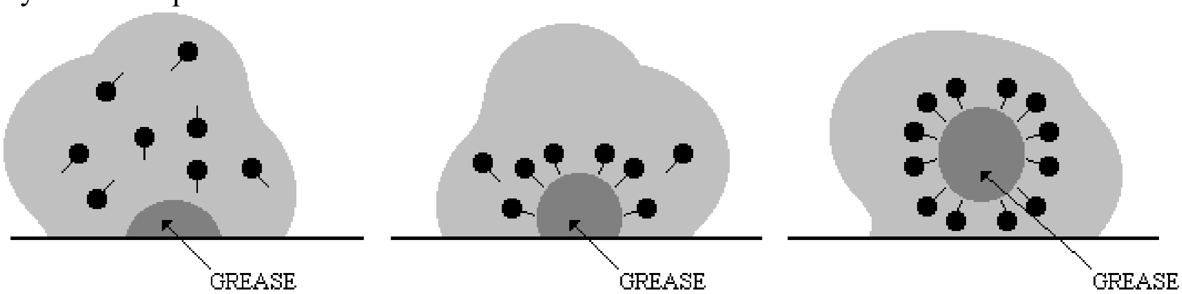
1.2 SOAP

Soap is probably the most commonly known surfactant. When soap is added to water, it acts as follow: Water being a polar liquid, at the water/air interface, the polar heads of the surfactant orient themselves towards the water while the hydrocarbon tails (non polar) orient themselves away from the water.



Being attracted by metal and glass the polar heads form an oriented watery film. As shown, the heads are in contact with the container leaving the tails in the water. This situation cannot persist on account of the incompatibility between the hydrocarbon tails (non-polar) and water (polar). A second row of surfactant is necessary, to re-establish equilibrium. The tails of this second row will be oriented towards the tails of the first row and the heads of the second row will be oriented towards the water as shown in the above figure.

Soap and water remove organic dirt such as fat or grease.
It is well known that a polar liquid does not mix with a non-polar liquid. Oil being non-polar and water polar explains why the two liquids do not mix.



When soap is added to water, the tails of the surfactant are attracted to the dirt. The attraction goes on until the surfactant forms an impenetrable film around it.

1.3 STRENGTH OF A SURFACTANT

A surfactant can be made more hydrophilic by increasing the polarity of the head, reducing the length of the tail or both. It can also be made more hydrophobic by doing the opposite.

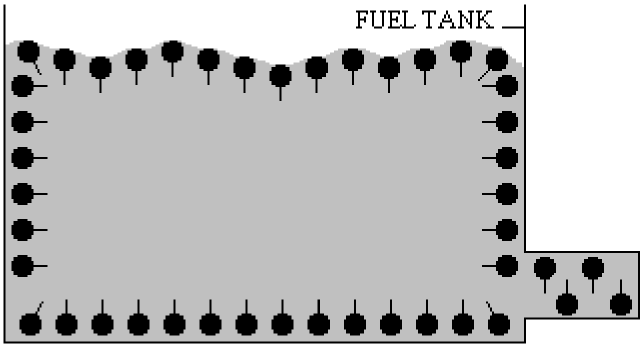
1.4 FUEL TREATMENT: PETROMIX

Soap as a surfactant is not soluble in fuel oil. ***Petromix is a*** specially designed amine which is completely soluble and self-dispersing in fuel oil.
As a surfactant, ***Petromix*** produces the following benefits.

1.4.1 PETROMIX CLEANS FUEL OIL DISTRIBUTION SYSTEM

PETROMIX coats all surfaces with a monolayer of surfactant such as the inside walls of reservoirs, the interior of tubing, the strainers and nozzles.

This monolayer coating removes all deposits such as sludge, coke or rust that exist on these surfaces.



The flowing and the atomisation characteristics of the oil is then improved since:

* the flow characteristics are governed by the interfacial tension between the oil and the metal components through which it flows. ***PETROMIX*** coats all metal components with a monolayer of fuel treatment. The governing factor of pumpability and atomisation then becomes the interfacial tension between the monolayer of surfactant and the oil. The monolayer of surfactant has its hydrocarbon tails oriented towards the oil. The fuel oil has more affinity with the hydrocarbon tails than with the metal.

* the removal of deposits like sludge, coke or rust will create less resistance inside the fuel oil distribution system.

1.4.2 PETROMIX DISPERSES SOLIDS AND REMOVES EXISTING SLUDGE

Residual fuel oil contains a good deal of solids in suspension. Besides depositing at the bottom of the reservoir to form sludge, these solids create numerous problems.

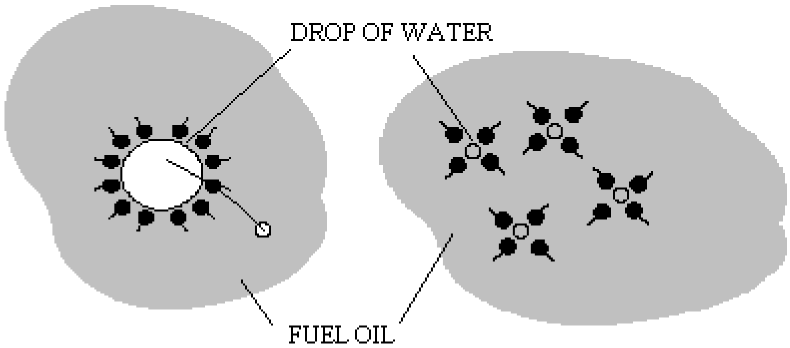
PETROMIX reduces significantly solids in suspension and prevents sludge formation at the bottom of reservoirs. Here is how ***PETROMIX*** operates:

* Many solids are asphaltenes which have flocculated because they lost their aromatic envelop. ***PETROMIX*** adds a new envelop which peptises the asphaltenes rendering them liquid again.

* Many solids are polar and have the tendency to agglomerate together forming large particles. ***PETROMIX*** breaks existing particles and prevents formation of new ones.

1.4.3 PETROMIX DISPERSES WATER

Water is always present in fuel oil in small quantities. Many water droplets can join together and coalesce to form larger water droplets that can seriously hinder the combustion or even stop it.
PETROMIX disperses the amount of water and prevents large droplets from forming, thus minimising the negative effects of water on combustion.



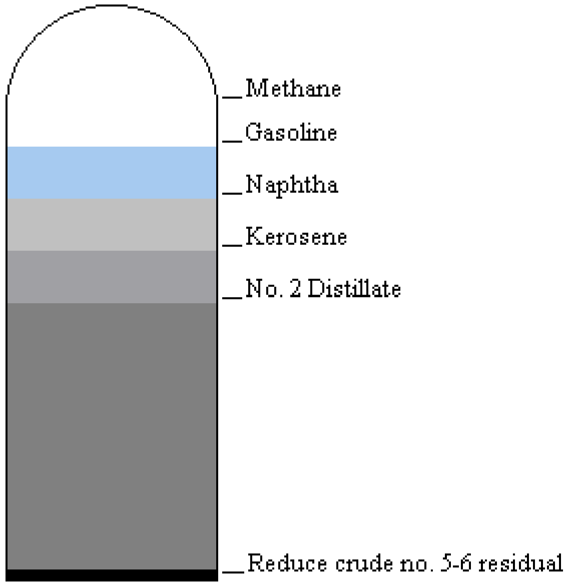
PETROMIX first coats the water droplets with a monolayer, the polar heads towards the water and the hydrocarbon tails towards the oil. ***PETROMIX*** forms an impenetrable film around the droplet. The oil is now in contact with the tails of the surfactant while the water is in contact with the polar heads. This creates a very stable environment for both water and oil.

The interfacial tension between oil and water is significantly reduced by the use of ***PETROMIX***. The interfacial tension governs the maximum size a water droplet can have. Since ***PETROMIX*** reduces significantly this tension, a slight shock will now be sufficient to break this water droplet into very small ones that will not halt or stop combustion.

SECTION 2
FUEL OIL

2.1 INTRODUCTION

Fuel oil is produced by distillation of crude oil. Below is a straight run crude oil distillation tower:



Residual crude no. 5-6

In the distillation tower, heat is supplied to the crude oil, thereby converting it into vapour. These vapours are then condensed back into liquid form, but the refining equipment is so constructed that these vapours are condensed at various levels in the fractionating tower. The lightest material condenses at the top, the heaviest at the bottom.

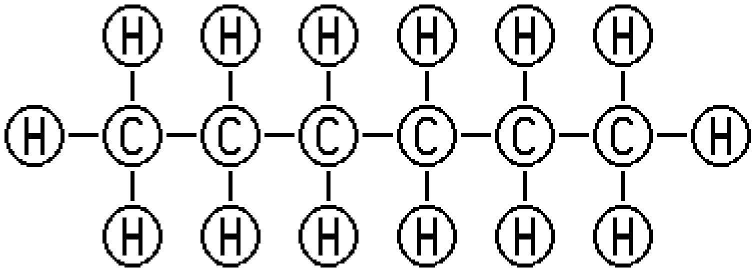
Historically, there has always been a depressed price structure associated with the residual fuel oil market in relation to distillate petroleum products. Consequently refiners have directed their attention towards processes that minimise the yield of residual fuel oil.

The residual oil produced by the straight run method nowadays, becomes the input for further processing. In other words the "residue" left over after all the goodies are distilled is then blended back, in most cases, with the least valuable "cutter stock" available in the refinery to meet viscosity specification. The end result is a fuel that has a tendency to smoke and which requires more attention and maintenance.

Some of the additional processes include: thermal cracking, catalytic cracking, hydrodesulphurizing, hydrocracking, and cooling. All these processes have one thing in common: they all degrade the bunker fuel quality.

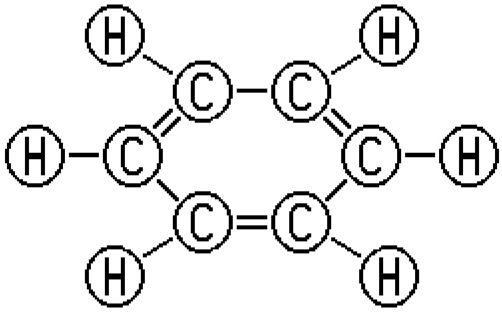
2.2 STRUCTURE OF HYDROCARBONS

PARAFFIN:



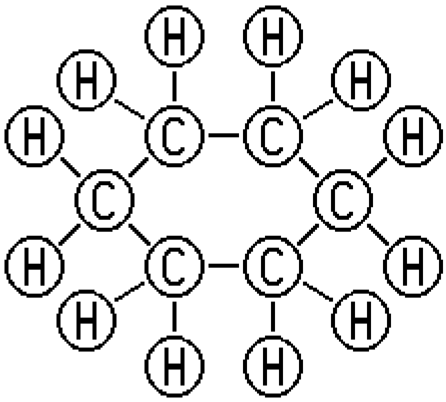
Normal hexane, C_6H_{14}

AROMATIC:



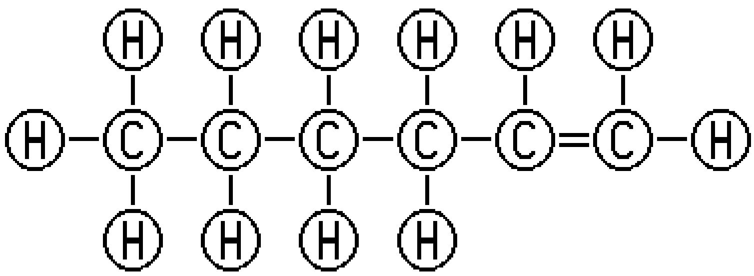
Benzene, C_6H_6

NAPHTENIC:



Cyclohexane, C_6H_{12}

OLEFINIC:



Hexene, C_6H_{12}

2.3 PROPERTIES OF HYDROCARBONS

PARAFFIN: lower specified gravity than aromatic hydrocarbons of the same boiling points, while the naphthenic and olefinic compounds are intermediate in density. Their stability to oxidation or chemical change is very good. These hydrocarbons are clean burning. Their spontaneous ignition points are fairly low.

AROMATIC: higher specific gravity than the other three classes. Contain a higher proportion of carbon than the other hydrocarbons. Consequently, they have a tendency to smoke which limits their desirability. This type of hydrocarbon is present in cracked oils in a greater percentage than in straight run oils, which accounts for the fact that cracked oils are the heavier and less stable.

NAPHTHENIC: extremely stable compounds. These hydrocarbons are not found in large volume in light oils, but they do have good burning quality and are usually found in heavy fuel oils.

OLEFINIC: usually distinguished by a characteristic odour. These compounds are more chemically active than the other three classes of hydrocarbons. They are subject to oxidation or polymerisation, forming gums. Olefins are not present in large amounts in straight run distillates, but are found in large quantities in cracked oils.

2.4 FINISH PRODUCTS

The basic philosophy of minimising residual fuel oil yield creates problems in both light and heavy fuel oil.

In heavy fuel oil, these processes remove the solvent from the fuel oil thus producing insoluble solids in suspension. Besides creating tank bottom deposits, the insoluble solids also exist in suspension in the bulk of the oil and create a number of other serious problems.

Light fuel oil is now a blend of straight run and cracked products. The latter fractions contain more aromatic hydrocarbons which have a tendency to smoke with more olefinic hydrocarbons which are subject to oxidation of polymerisation to form gums and bacteria.

SECTION 3
BOILERS

3.1 INTRODUCTION

The drawing below shows a typical boiler installation.

Air-gas and steam-water circuits connect will meet each other in the steam-generating unit, which is usually made out of elements shown here. For an oil-fired unit, a pump takes fuel oil from a tank and forces it into a furnace by spraying through burners. Atmospheric air enters a forced-draft fan inlet, flows downward through an air heater around vertical tubes, then proceeds through ducts to the burners, where it mixes with sprayed fuel oil before burning in the furnace. After burning the combustion gasses flow through several boiler gas passes, combustion gas flows down through an economiser around water-filled tubes, up through air-heater tubes. An induced draft-fan forces the exhaust gasses up a duct to the stack and atmosphere. Feedwater flows through the economiser tubes to the boiler drum. Steam from the top of the boiler drum passes through a manifold into the superheater and then out through a steam line.

3.2 FUEL FLOW

The fuel oil is pumped from the storage tank to the burners. If residual fuel no 6. is used, it is necessary to heat it up to around 60 °C so that it can be pumped easily.

Before the fuel oil is sent to the burners to be atomised, it passes through an oil preheater which increases the temperature to around 94 °C., thus reducing the fuel oil viscosity to the burner manufacturer's specification (around 31,3 cSt).

Then the oil is sent to the burners to be atomised and mixed with air in preparation for combustion.

3.3 AIR FLOW

Air is drawn from the atmosphere by a fan. It circulates on one side of the air heater, while on the other side the combustion gasses circulate, transferring the heat to the cooler air from the atmosphere.

The hot air is then mixed with the atomised fuel in the furnace to produce the flame.

The theoretical quantity of air necessary for combustion is called stochiometric air. It is often necessary to use excess air in the furnace in order to get a good combustion, otherwise fuel molecules do not necessarily have enough oxygen molecules for proper combustion.

3.4 COMBUSTION

The ideal chemical formula for the combustion of hydrocarbons is:

$$C_nH_m\ (n+\frac{m}{4})\ O_2 \rightarrow n\ CO_2 + \frac{m}{2}\ H_2O$$

The preheated oil is atomised by the burners and is mixed with the heated air in the furnace to form the flame. The products of combustion which carry the heat, are directed towards the superheater on top of the furnace where they will give some of their heat to the flowing steam in the superheater. Further on, the flue gas meet another heat exchanger, the economiser, where again it loses some of its heat, this time, to the feedwater running in the economiser.

Still further on, the flue gas meets another heat exchanger, the air heater, where again it loses some of its heat to the combustion air before this fresh air reaches the furnace.

Then the cooler flue gas is released in the atmosphere through the stack.

3.5 STEAM FLOW

The steam cycle starts with the water entering the economiser. It comes from the process and make-up water.

The feed water is heated by the flue gas passing in the economiser. Once heated, this water is returned to the drum. In the drum, water flows through the downcomers which are feeding the waterwalls inside the furnace. Heat from the flame is transmitted by radiation to the water in the waterwalls. A mixture of water and steam is then returned to the drum by the risers.

One of the functions of the drum is to separate steam from water. The saturated steam is drawn from the drum and circulates in the superheater where heat from the flue gas is transferred by convection. The heat transfer takes steam in saturated state and brings it to the superheat state. This means that no moisture is present and it would require a substantial drop in steam temperature before moisture appears.

This steam is then directed to the process.

SECTION 4
FUEL TREATMENT: PETROMIX

4.1 INTRODUCTION

PETROMIX is a highly efficient fuel oil treatment specially designed to take care of many operational problems usually encountered in boiler installations.

4.2 SOLIDS IN SUSPENSION

4.2.1 PROBLEMS

Residual fuel oil is a mixture of liquid oil and solids in suspension which have a tendency to deposit on the bottom of reservoirs.

Also, both light and heavy fuel oil are subject to oxidation, which is a chemical reaction of the fuel oil in storage with oxygen. This oxidation process produces solids which again have a tendency to deposit.

Besides forming deposits on the bottom of reservoirs, solids also exist in suspension in the bulk of the oil and are drawn to the burner by the suction line. The combustion equipment must then burn two types of material: the liquid oil and the solids in suspension. The solids being more difficult to burn than the oil, all the boiler controls are adjusted to obtain a satisfactory combustion of these solids.

Furthermore, the sludge, which is drawn into the suction line, forms coke on hot surfaces which reduces the flow quality, the efficiency of the heat exchanger and the quality of atomisation.

Moreover, part of these solids do not undergo a complete combustion and exist in the flue gas as soot and unburned solids. Some of these particles will stick to the tubing inside the boiler, thus reducing the efficiency of the heat exchanger. The solids that do not adhere to the tubing are released in the atmosphere as pollutant emissions and acid smut.

4.2.2 SOLUTION

For all those reasons, it is highly desirable, even necessary, to reduce or eliminate the solids which are present in fuel oil.

* Many solids present are asphaltenes which have flocculated because they lost their aromatic envelop. ***PETROMIX*** will reform this envelop which peptises the asphaltenes rendering them liquid again.

* Many solids are polar and have the tendency to agglomerate together forming large particles. ***PETROMIX*** breaks up and prevents such agglomerations.

4.2.3 TEST TO SUPPORT

* Anti-Screen Clogging test which is a standard Socony Mobil test to measure the dispersancy characteristics. Without ***PETROMIX*** 117 mg of synthetic sludge was retained on the mesh filter. With ***PETROMIX*** only 13 mg of sludge was retained on the mesh. With the fuel treatment, thirteen (13) time less sludge was left on the mesh filter showing the excellent dispersion quality of ***PETROMIX***.

* Sediment by extraction (ASTM-D473) and sediment by filtration show that when these tests are run on fuel oil treated with the additive, more than 50% of the sediments are dispersed.

* Our customers all agree that their strainers are now much cleaner.

* Some of our customers had large sludge deposits in their tanks. After one (1) month of using ***PETROMIX***, all the sludge was removed.

* A simple test can be done. Sprinkle carbon lamp-black on water. Dip a pin in ***Petromix*** and then dip the pin at the centre of the floating carbon lamp black. The lamp-black is instantly dispersed to the sides of the container.

4.3 VISCOSITY

4.3.1 PROBLEMS

Suspended solid particles increase the apparent viscosity. The higher the viscosity, the more difficult is the flowing quality and, consequently, the worse the atomisation will be.

Moreover from delivery to delivery, fuel oil viscosity is not always consistent. It is then necessary to set the oil preheating temperature high enough to satisfy the highest potential oil viscosity that could be delivered, triggering then a lost in efficiency.

4.3.2 SOLUTION

As described in article 4.2, ***PETROMIX*** disperses and solubilises the solids in suspension in fuel oil, thus producing a reduction in viscosity.

By reducing the viscosity the preheating temperature can thus be reduced, increasing thereby the efficiency of the boiler.

4.3.3 TESTS TO SUPPORT THE ADVANTAGES OF PETROMIX

* University of Sherbrooke test has shown a viscosity reduction of 5 to 7% with the addition of ***PETROMIX***.

* Our customers have experienced substantial improvement in fuel oil flow characteristics.

* A simple test consist of filling two beakers with bunker fuel, one with treated and one with untreated fuel oil. We dip a spatula in each beaker. A depression is left at the surface of the liquid when the spatulas are removed. We notice that the depression disappears faster with the treated oil than with the untreated oil.

* Two bottles are filled with SAE 40 grade oil. One bottle is treated with ***PETROMIX***. We shake the bottles and deposit them on the table. We notice that the treated oil slides better on the walls of the bottle and settles faster than the untreated oil.

* On the most elevated side of two inclined planes, we pour bunker fuel, one treated and one untreated with ***PETROMIX***. We notice that the treated fuel oil slides down faster than the untreated fuel oil. Also, if we release two equivalent metal blocks we notice that the block sliding on the treated fuel oil arrives at the bottom before the other block.

4.4 WATER NORMALLY PRESENT IN FUEL OIL

4.4.1 PROBLEMS

Water in small quantity is usually found in fuel oil. This water, being a source of oxygen, promotes oxidation of the fuel oil and produces solid particles.

Water with olefinic hydrocarbons promotes bacterial growth which forms masses of floating solids which interfere with normal combustion operation.

Furthermore, water droplets can coalesce to form larger ones that can interfere with normal operation by producing flashback or flame instability.

4.4.2 SOLUTION

PETROMIX reduces the interfacial tension between fuel oil and water thus preventing coalescence of water droplets. Furthermore, it breaks up existing ones, thus eliminating flashback or flame instability.

As water droplets break down, each part of it is coated with a monolayer of ***PETROMIX***, reducing oxygen availability in the fuel oil and preventing therefore oxidation and bacterial growth.

4.4.3 TEST TO SUPPORT

* *__PETROMIX__* reduces significantly the interfacial tension as shown by the test conducted at Sherbrooke University

* A simple test consists of filling partly a glass with water, laying a razor blade on the water so it will float and pouring light fuel oil on top of the water. The razor blade will then be at the water/fuel oil interface. Dip a pin first in ***PETROMIX*** and secondly in the fuel oil/water containing the razor blade. Immediately, because of the interfacial tension reduction, you will see the razor blade sink to the bottom of the glass.

4.5 FUEL OIL CONTAMINATED WITH WATER

4.5.1 PROBLEMS

Occasionally, fuel oil gets contaminated with water on account of various reasons like a leaking manhole, perforated reservoirs and so on.

If too much water is present, fuel oil is rendered unusable, thus necessitating the utilisation of a demulsifying agent to render the fuel oil adequate.

4.5.2 SOLUTION

When there is an excess of water ***PETROMIX*** also acts as a demulsifying agent.

4.5.3 TEST TO SUPPORT

* Mobil oil, Demulsifying test was run on five (5) samples, one with no treatment, one with ***PETROMIX*** and three (3) others with different fuel oil additives. The test bottle containing producer’s surfactant has demulsified faster and better than any of the four (4) other bottles.

* As reported by a ship engineer who had a tank containing fuel oil contaminated with sea water and who, after adding ***PETROMIX***, was able to drain the water out of the tank and use the fuel oil in its diesel engine without any problem.

* Take two (2) bottles, partly filled with 50% SAE 40 oil and 50% water. In one bottle, add a few drops of ***PETROMIX***. Shake the bottles vigorously then let them rest on the table. Notice that the water and the oil in the bottle containing the surfactant is separating faster than the other bottle.

4.6 BENEFITS OF USING PETROMIX

The following benefits can be obtained by using ***PETROMIX*** fuel oil treatment. All these results, however small some may be, all add up to net savings either as increased heat, higher efficiency or less maintenance.

4.6.1 PREVENTION OF SLUDGE FORMATION

PETROMIX enhances the chemical stability of the oil and improves the compatibility between the residual oil and the light fuel oils used in today’s blending from different crude oil sources.

4.6.2 DISPERSION OF ORGANIC SEDIMENTS

Many solids such as asphaltenes and resins are colloidally dispersed in nowadays residual fuel oil. These solids join in to form large sludge particles which hinder proper atomisation which result in a poor combustion, carbon smut and soot. ***PETROMIX*** disperses the organic sediments and prevents the entire equipment and system from coagulated sludge.

4.6.3 CLEAN TANKS, PIPELINES, STRAINERS, PREHEATER AND A MORE UNIFORM OIL

Derive from prevention of sludge formation and dispersion of organic sediments.

4.6.4 REDUCTION OF INTERFACIAL TENSION

PETROMIX reduces the interfacial tension between fuel oil and water, thus preventing coalescence of water droplets and eliminating flashback and flame instability.

When the oil is treated with ***PETROMIX***, the system is clean, the proper atomisation is obtained and a good combustion follows. The end result is higher efficiency with the following additional benefits:

- burner free of carbon (coke)
- a steadier flame
- less smoke
- increased CO_2
- reduced stack temperature
- less fuel oil consumption

In order to obtain maximum results with ***PETROMIX*** fuel oil treatment, it must be added to the oil in the storage tank. Adequate mixing is obtained by injecting gradually the required amount of ***PETROMIX*** into the tank fuel filling line during bunkering.

4.6.5 ONE GALLON OF PETROMIX TREATS 20,000 GALLON OF FUEL OIL

The cost of the treatment is around 1½ to 2 % of the fuel oil price. The normal savings with ***PETROMIX*** should be approximately 4% and more of the fuel oil costs.

SECTION 5
HOW TO CONDUCT A TEST

5.1 INTRODUCTION

Once the customer is convinced of the advantages of the product, a thorough test conducted at his plant should convince him that ***PETROMIX*** does really solve his problems.

A three months test is desirable. First month results should be disregarded on account of the cleaning job in progress.

The basic philosophy of a test is to monitor the variables that have motivated the customer in buying the product. The measurement of these variables should be done with and without the fuel treatment.

The most common variables that motivates customers to use ***PETROMIX*** are:
- less sludge deposit
- cleaner strainers
- opacity of the stack
- elimination of vanadium deposits
- fuel oil economy

5.2 FUEL OIL ECONOMY

5.2.1 POUNDS OF STEAM TO POUNDS OF FUEL OIL

First, a base line is established. Daily pounds of steam produced is divided by daily pounds of fuel oil consumed. It is desirable that the boiler operates at a constant load and that the steam quality is the same. Fuel oil varies from delivery to delivery. It is therefore important to adjust the temperature of the fuel oil consumed to reach the right viscosity.

The baseline should continue as long as the daily ratios are not repetitive.

Once these are reached, we can start adding ***PETROMIX*** and monitor the boiler at the same way we did during the baseline. It is important to reduce the preheating of the oil by 10% after one week.

Average of pounds of steam produced per pounds of fuel oil consumed during baseline should be compared to the average of test run with the fuel treated with ***PETROMIX***.

5.2.2 DETERMINATION OF BOILER EFFICIENCY - SHORT METHOD

Page .... lists the variables which are necessary to monitor in order to evaluate the performance of the boiler. It also gives the calculation to determine the efficiency of the boiler.

It is necessary to run the baseline as long as the efficiency is not repetitive. Once this condition is attained, the surfactant will be added to the fuel oil. The efficiency will be monitored the same way as during the baseline but the first month should be compiled for information purposes only and disregarded completely for evaluation.

5.2.3 DETERMINATION OF BOILER EFFICIENCY - ASME METHOD

Page ....to................. list all variables and all calculations necessary to conduct this evaluation.
The tests should be conducted in the same manner as the short method described in section 5.2.2.

5.3 SLUDGE DEPOSITS

The most evident sludge deposits are on tank bottoms, in strainers and in the distribution system.

5.3.1 TANK BOTTOM

A sludge profile of the tank bottom should be taken to determine the deposits thickness before ***PETROMIX*** is added to the fuel oil.

Once ***PETROMIX*** is added to fuel oil, sludge thickness should be monitored twice a week to follow its regression. Normally, after three (3) weeks of treating the fuel oil, the sludge should be removed. The customer should go on using ***PETROMIX*** to prevent future deposit formations.

5.3.2 STRAINERS

It is necessary to know the strainers cleaning frequency and to have a measure of their impurities.

The cleaning frequency will be supplied by plant personal.

The quantity of the impurity can be evaluated by weighting or by taking pictures of strainers before ***PETROMIX*** is added.

Within a two weeks period it should be easy to notice a difference in weight. A good picture will show clean strainers.

5.4 OPACITY OF THE STACK

With today's stringent environmental regulations, pollutant emissions are a very serious matter.

Before using ***PETROMIX***, the smoke spot number (ssn) should be determined with a Bacharach smoke tester. This instrument is an aspirator which sucks a sample of flue gas from the flue through a piece of filter paper. The deposits on the filter paper will vary in shade from light grey to black, depending on the quantity of smoke in the flue gas. The coloration on the filter paper is then compared with the Bacharach ssn which is an arbitrary scale ranging from 0 to 9 the latter being the darkest.

Care should be taken when determining the SSN, that the boiler is not modulating and that all operating conditions are stable. Also note should be taken of the load on the boiler at that moment.

SSN at different load should be taken during the baseline in order to establish a profile.

Once ***PETROMIX*** is added to fuel oil, the first month's results should be taken for information purposes only. Experiences have shown that, after 2 weeks, the SSN is normally reduced by about 2 numbers or more.

5.5 VANADIUM DEPOSITS

After a three months period, the use of ***PETROMIX*** reduces significantly vanadium deposits. In some cases, as past results show, the vanadium deposits were completely eliminated.

SECTION 6
PETROMIX CONCENTRATION

6.1 INTRODUCTION

On account of different fuel oil and different combustion equipment, it might be necessary to readjust upward or downward the concentration.

6.2 INITIAL CONCENTRATION

Initiating a test is a very serious matter. If the installation is ten (10) years old or more, it can be assumed that the tank and the fuel distribution system is probably full of deposits.

For the first week, maintenance and surveillance should be increased on the strainers, especially those after the preheater.

In a diesel engine operation the sequence of events should be the same as described above with more emphasis in cleaning the storage tanks.

6.3 PERMANENT CONCENTRATION

Once the test period is over, either because of a change in the fuel oil quality or a change in the customer's combustion equipment it might be necessary to readjust the concentration of ***PETROMIX***. If so, two factors will influence the necessary concentration:

- sludge dispersancy
- colloid stabilisation or anti-fouling properties.

6.3.1 SLUDGE DISPERSANCY

The most important actions of the surfactant are: solids dispersion and metal coating. If, after the test period, the strainers are not much cleaner, it would mean that either the solids are not dispersed adequately or that the metallic parts are not adequately coated by ***PETROMIX*** or both. In this case, it would be necessary to increase concentration.

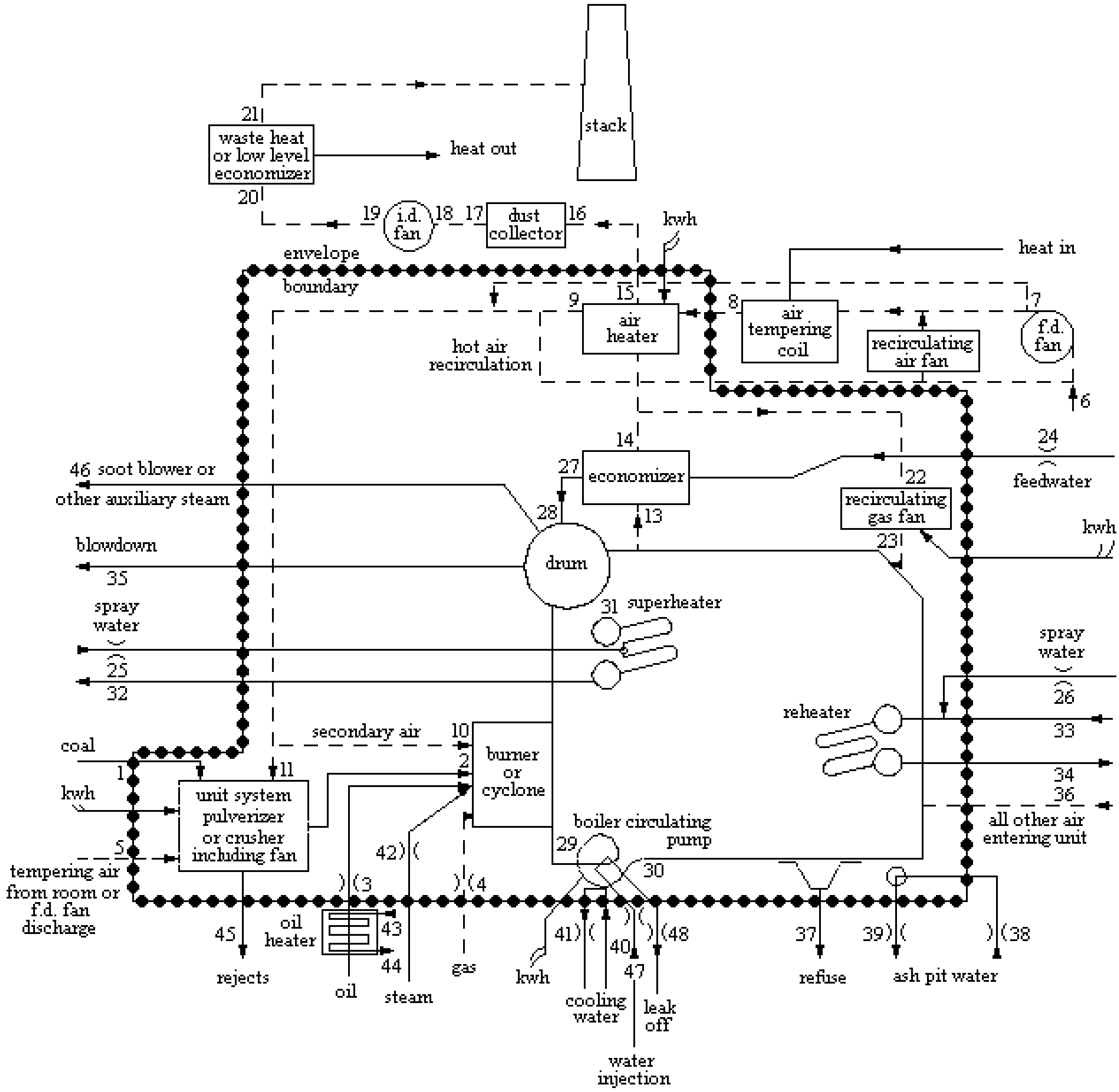
If the strainers are very clean, concentration can be reduced by 10%. After a test period of two weeks, it could be decided to keep the new concentration or to lower it, depending on the cleanliness of the strainers.

6.3.2 COLLOID STABILISATION

Anti-fouling is determined by the amount of sludge formation when a fuel is stressed by application of heat which lower the colloidal stability of fuel. In other words, it is the tendency of a fuel to deposit coke and resins on hot metal surfaces.

The use of ***PETROMIX*** reduces the preheating temperature of the fuel oil.

Once this has been done, and new coke formation still appears in the fuel oil preheater or on the burnertips the concentration of ***PETROMIX*** should be increased.


stack
waste heat
or low level
economizer
heat out
i.d.
fan
dust
collector
kwh
heat in
envelope
boundary
air
heater
air
tempering
coil
recirculating
air fan
f.d.
fan
hot air
recirculation
46 soot blower or
other auxiliary steam
economizer
recirculating
gas fan
feedwater
kwh
blowdown
drum
spray
water
superheater
spray
water
reheater
secondary air
burner
or
cyclone
coal
kwh
unit system
pulverizer
or crusher
including fan
tempering air
from room or
f.d. fan
discharge
boiler circulating
pump
all other air
entering unit
oil
heater
rejects
oil
steam
gas
kwh
cooling
water
leak
off
water
injection
refuse
ash pit water

Please notice the following when using PETROMIX

Heavy and light fuel oil and diesel oil

- Principle dosage 1 Litre on 20.000 Litres (1 Gallon on 20.000 Gallon).
- Please see to it that mixing is taking place properly, for instance, add PETROMIX when filling the storage tanks by means of injection in the pipeline.
- PETROMIX sees to it that the agglomeration of Asphaltenes is prevented. Because of this a better absorption of oxygen is possible. Further more Asphaltenes have the phenomena to agglomerate with sulphur and sodium. PETROMIX prevents this agglomeration.
- The low percentage of water which is always present in fuel oil fuel are broken into minute droplets
- The use of PETROMIX will give cleaner burning rooms and injectors.
- Less deposits will be left in the burning room.
- The flow of the fuel oil through the pipes will be positively increased because of a lower internal tension of the fuel oil.
- PETROMIX coats all surfaces with a monolayer of surfactant. Because of this monolayer not only a corrosion protection is achieved but also the clogging from paraffin's of filters and copper pipes is prevented.
- PETROMIX sees to it that the clogging of filters is reduced to an absolute minimum.
- PETROMIX gives a reduction in fuel consumption up to 5 %
- PETROMIX protects against corrosion without reducing the heattransfer capacity of the boiler.
- The pre-heating of the fuel oil should be reduced with 5 - 10 % depending on the type of Bunker oil is used.
- Overdose of oxygen (air) should be reduced to keep your CO at zero.
- A measurement of the stack temperature is advised in order to show the increase in efficiency.
- The smoke spot number, tested with bacharach will be reduced with at least two points, a bacharach one should be easy to obtain.
- PETROMIX reduces the frequency of sub blowing with at least 50 %.
- PETROMIX keeps the boilers clean(er) which results in a higher efficiency from 2 up to 5 %.
- dosage ratio:

dosage ratio:	< 8 % asphaltenes and no more than 0,2 % water	1 : 20.000 Litres
	8 to 10 % asphaltenes and 0,3 % water or less	1 : 16.000 Litres
	10 to 12 % asphaltenes and 0,3 % water or less	1 : 14.000 Litres
	> 14 % asphaltenes and more than 0,5 % water	1 : 10.000 Litres

Comparison between PETROMIX and a conventional MgO fuel additive

DISADVANTAGES	
MgO	*PETROMIX*
1. Leaves ashes on the economizers in the fire box and out of the chimney(stack) 2. Requires a lot of MgO to take care of the V_2O_5 and sulfur 3. Requires special metering and dosing pumps and equipment as these products can only be added to the fuel line just before the burner equipment 4. Since MgO is abrasive metering pumps do not last a long time - the metal oxide causes also rapid burner nozzle erosion 5. Does not produce any fuel economy 6. High dosage rate 7. MgO agglomerates with the cokes 8. A coating of white powder on the tubes, reduce the heat transfer, thus less efficiency per boiler	NONE

Comparison between PETROMIX and a conventional MgO fuel additive

ADVANTAGES	
MgO	*PETROMIX*
1. Prevents corrosion	1. Prevents corrosion 2. Agglomeration of asphaltenes is prevented - PETROMIX disperses solids and removes existing sludge 3. The low percentage of water is broken into minute droplets thus PETROMIX disperses water 4. Cleaner burning rooms and injectors - PETROMIX cleans fuel oil distribution system 5. Clogging of filters and copper pipes is prevented 6. PETROMIX gives a reduction in fuel consumption up to 5% with an efficient boiler 7. Pre-heating of the fuel oil can be reduced with 5 - 10% depending on the type of Bunker oil which is used 8. Overdose of oxygen should be reduced to keep your CO at zero. Overdose from 1.2 to 1.5 % of O_2 is easy to reach 9. Lower NO_X because of a lower overdose of oxygen 10. Low dosage rate up to 1 : 20.000 11. Much higher efficiency 12. The first sign of effect, after few days, is the significant reduction in exhaust smoke, which apart from visual detection can be measured by means of a photocell (bacharach) in order to gauge the smoke density 13. Stable viscosity of the fuel oil - flow of the bunker fuel oil through the pipes will be positively increased because of a lower internal tension of the fuel oil 14. Reduces the frequency of sub-blowing with at least 50%

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