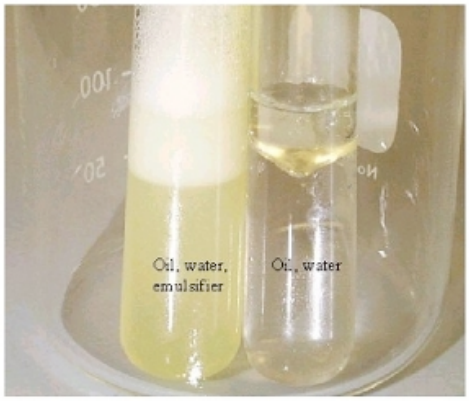
# 3rd Rock Energy Water In Fuel Technology

## Mix Water With Your Fuel - But Oil And Water Don't Mix - Do They?




**And yet there are liquids where oily substances are mixed with water;** not in a chemical solution, but in an emulsion where tiny droplets of oil are mixed with tiny droplets of water. Ketchup, for example. One of the ways to achieve this is to use ultrasound, or sound at a pitch above 18,000 cycles/sec (inaudible to the human ear). The fast and forceful vibrations will break up both the oil and the water into tiny droplets and intersperse them in each other to form an emulsion. (Ultrasonic is expensive though and we don't recommend it for that reason)

The following is our solution to reduce dependence on foreign oil and lower greenhouse emissions right now!

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**The results of the comparison of the combustion of anhydrous and water emulsified liquid fuels have proved the following:**

- 1. Emulsified liquid fuels burn faster than anhydrous ones.
- 2. Water in emulsified fuels does not impair, but improves the combustion process, owing to the additional simultaneous breaking of the droplets to the increase in the evaporation surface of the droplets, and to a better mixing of the burning substance with air.
- 3. The reduction of the combustion time of emulsified fuels has a favorable influence on the burning of the sooty residue, thus improving the completeness of the fuel combustion and reducing the deposition of soot (scale) on the working surfaces.

**See our actual test at bottom of this page...**

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**NOTICE: The oil industries are embracing this new idea for diesel, but they are going to sell you the fuel with the water already added.** The cost will not reflect the fact that a large percentage of the product is cheap widely available water. Don't pay extra for something that falls freely from the sky.

Chevron's water fuel (Sorry-it appears they already removed that link) Look down in the 4th paragraph, this is where they casually mention that it is a "water-in-fuel" diesel blend. This fuel will somewhat quietly replace diesel, in California first, marketed as a low sulfur emitting, cleaner burning, fuel. Which it is. It works just as well, if not better with gasoline.

Here is another brand that is being introduced by a European company: European water fuel

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**We have a revolutionary mixing system that makes it possible to "burn" emulsions of fuel and water. It works in a car engine, diesel engine as well as an oil furnace or boiler and cuts pollutants, too.**

**You can also get our fuel emulsion kit for home use.**

Our unit is designed using U.S. Patents 3,937,445 (Process and apparatus for obtaining the emulsification of nonmiscible liquids) and 4,468,127 (Process for metering and mixing liquids in arbitrary mass proportions).

Although two liquids, water and fuel, are discussed on this page the process and apparatus will operate with a multiplicity of liquids. The units works equally well with slurries, gels and thixotropic materials.

Equipment and technology for new or waste oil on small or average industrial boilers and ship engines. Save up to - 500 dollars and more per day! (Unit on left. Water tank and control unit not illustrated.)

ON-BOARD DIESEL OIL AND WATER EMULSIFICATION SYSTEM The Fuel Optimizer makes an emulsified fuel of diesel oil-in-water without the use of a surfactant.

If your business or ship has a problem with oily waste water - this water in fuel emulsion technology also will recycle oily waste water for safe use in a combustion process (such as a boiler or genset) which saves the business or ship money and benefits the environment.

Our system can be used with a variety of fuels including diesel #2, marine diesel oil (MDO) and heavy fuel oil (HFO).

In our fuel system the fuel emulsion is made just before it is used in the engine or boiler. There is no need to use any additives or surfactants. The residence time of the fuel emulsion in the fuel lines is less than the 'creaming rate', i.e., separation rate, of the emulsion. In this manner it is less expensive to make the emulsion, use it, and in addition it is more stable over a larger range of conditions than when the emulsion is made with additives, thus there is no need to store fuel emulsions.

All prices are U.S. funds (Contact us to purchase this item)
25 gallons per hour $5800
50 gallons per hour $8100
100 gallons per hour $9800
250 gallons per hour $11,500
500 gallons per hour $14,900

Other volume prices available upon request.

Prices are plus actual shipping to your location.

1/2 Down required with all orders. Balance plus shipping due before shipment.

Shipped within 3 weeks

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**Fuel Emulsion System For Cars And Trucks.**

(All components not shown)

For your gasoline or diesel car or truck. Passenger or commercial. Only $985 with free shipping. Up to 35% water injection capability.

Please contact us for payment options.

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**Get our water Injection kit with either a 1 gallon or 5 gallon tank.**

If you don't want to use the emulsified fuel device this is an inexpensive add-on alternative for cars and trucks which reduces emissions and increases mileage, and can even allow regular cars to run on low octane gasoline or ethanol fuels.

Get a lot of the same advantages as emulsified fuel with our water injection system. Increase milage... Increase power... and reduce emissions.

**NOTE: Legal in California only for racing vehicles which may never be used upon a highway.**

- Universal kit includes everything you need for installation
- Boost Safe lets you retard the timing or reduce boost if the system runs out of fluid or detects an error
- Progressive, controller-driven 150-PSI pump provides boost-dependent variable flow
- One- or five-gallon tank with integral fluid level sensor
- Dash light for system status and low fluid warning
- Use straight water or Ethanol and Methanol Compatible (up to 50% in solution with water)
- Includes three jets to match your power requirement

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Water injection kit 1 gallon Only $495.00 with free shipping.

Please contact us for payment options.

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Water injection kit 5 gallon Only $685.00 with free shipping.

Please contact us for payment options.

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EMULSIFIED FUEL PRODUCED ON DEMAND
NO ADDITIVES OR SURFACTANTS
AVOIDS FUEL STABILITY PROBLEMS AND DISTRIBUTION AND STORAGE DIFFICULTIES
EMULSIFIED FUEL COSTS FAR BELOW REGULAR PETRO-FUEL PRICES!
25% NOx REDUCTION
50% SMOKE AND PARTICULATES REDUCTION
REDUCES FUEL COST

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**Fuel Emulsion System For Cars And Trucks.**

(All components not shown)

For your gasoline or diesel car or truck. Passenger or commercial. Only $985 with free shipping. Up to 35% water injection capability.

Please contact us for payment options.

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During the blending process the fuel surrounds the water droplets to prevent the water from separating out of the mixture. The encapsulation prevents the water from contacting any metal engine parts, thereby allowing the fuel to perform in a similar fashion to conventional diesel. The fuel emulsion can be used in existing new and old diesel engines, with and without after-treatment add-ons and without engine modifications or replacements. Potential applications include centrally fueled on and off-road uses including school bus and transit fleets, construction and agricultural equipment, as well as coastal marine ships and stationary power generators.

The impact of diesel fuels both environmentally and with regard to air pollution has been the subject of much research. The main air pollutants from diesel engine exhaust

gas are carbon monoxide (CO), nitrogen oxides (NO.), carbon dioxide (CO2), hydrocarbons and particulate matter.

Our main purpose is to save you money, however, it is well known in the industry that NOX emissions from diesel engines are reduced by mixing water in the fuel which in turn reduces combustion temperatures.

The emulsified fuel optimizes combustion by which, in turn, reduces nitrogen oxides, the major cause of air pollution. In this regard, moisture in the form of particles is homogeneously contained in the emulsified fuel, the fuel limits the generation of high temperatures in local areas in the flame and further, 20 to 30 volume % of moisture lowers the combustion temperature, primarily through latent heat of evaporation. Therefore the emulsified fuel limits the generation of nitrogen oxides by preventing high temperatures in local areas. The water is proportionately mixed into the fuel and the mixture is injected into the cylinders. When water is added to the fuel, one of the two liquids disperses into the other liquid, and emulsion occurs thereby. Since the appropriately mixed emulsion is formed in a stable condition, the separation between water and fuel before combustion is not an issue.

**Now Available For Your Truck Or Heavy Equipment Diesel Engine**

- EMULSIFIED FUEL PRODUCED ON DEMAND
- NO ADDITIVES OR SURFACTANTS
- AVOIDS FUEL STABILITY PROBLEMS AND DISTRIBUTION AND STORAGE DIFFICULTIES
- EMULSIFIED FUEL COSTS FAR BELOW REGULAR PETRO-FUEL PRICES!
- 25% NOx REDUCTION
- 50% SMOKE AND PARTICULATES REDUCTION
- REDUCES FUEL COST BY AS MUCH AS 35%

This is our solution to reduce dependence on foreign oil and lower greenhouse emissions right now!

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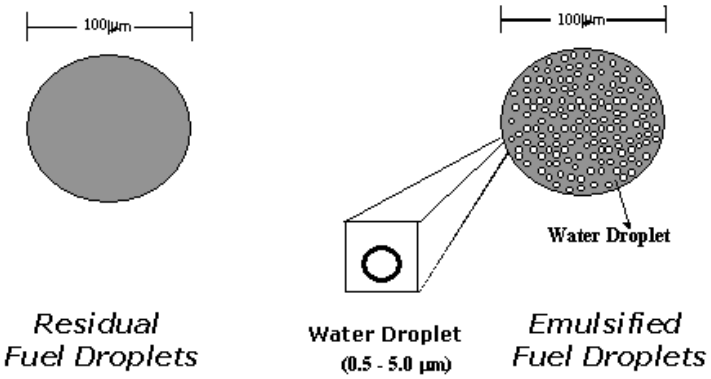
The encapsulation prevents the water from contacting any metal engine parts, thereby allowing the fuel to perform in a similar fashion to conventional diesel. The fuel emulsion can be used in existing new and old diesel engines, with and without after-treatment add-ons and without engine modifications or replacements. Potential applications include Over The Road Diesel Trucks, centrally fueled on and off-road uses including school bus and transit fleets, construction and agricultural equipment, as well as coastal marine ships and stationary power generators.




The Figure 1. Comparison of Emulsified Fuel & Residual Fuel Oil

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The same process above applies to home heating oil.

The Fuel Optimizer is able to break water into particles about one fifty-thousandth of an inch in diameter and to disperse them evenly to create an emulsion that is 70 percent gas and 30 per cent water (can be up to 50/50).

The small water droplets expand on heating, then explode into steam (and HHO), in turn shattering the oil into even finer particles, and thus increasing the surface area of the fuel exposed for burning.

Our fuel emulsifier will produce upon combustion a number of heat units almost equal to and in some cases greater than that provided by combustion of the hydrocarbon used in the process.


Thus, when the emulsion hits the ICE (internal combustion engine) or furnaces combustion chamber, the water "explodes" into superheated steam, adding to the energy output of the oil or gas.

Our system will result in oil savings of 25% for oil fired boilers, and we have a money-back guarantee if you didn't save at least 15%.

A ship can save up to 7 tons of oil a day in port and will be able to burn a lower grade of bunker oil.

For boilers, in more detail, we make small droplets of oil with a smaller droplet of water contained inside. As the oil droplet heats up and is burned, the contained superheated water droplet explodes into steam, dispersing the oil. The effects on the flame is obvious (it is brighter) and the stack temperatures go down. The increased efficiency comes about because the flame is more emissive in the infra-red, so more energy goes into making steam and less goes up the flue.

In a car it develops more power, the explosion in the engine cylinder, makes producer gas (H2 and CO) and the steam in the flame goes to pushing the pistons, instead of warming the radiator. It also burns cleaner than straight gas or diesel.

The water, mixed with fuel, in the combustion chamber with the burning fuel will flash into steam and drive the piston along with the other expanding gases. This is why you get increased mileage from less btu's of fuel. The efficiency of the engine is increased by utilizing the traditionally wasted heat to expand steam.

You can dilute your fuel by up to 40% with water and not lose any performance and get as good or better gas mileage as you did with 100% fuel. In the combustion chamber the fuel ignites flashing the water into steam. The steam expansion, along with the gases from combustion, drives the piston. This turns what was an internal combustion engine (ice) into a hybrid ice/steam motor. Most ice's can run on this fuel with no modifications!

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Emulsified fuel applications:

On-Road:

- Motor Cycles
- Automobiles
- Trucks
- Public fleets.
- Mass transit fleets.
- Private fleets.
- Garbage collection fleets.

Off-Road:

- Marine engines.
- Locomotives.
- Power generation.
- Construction equipment.
- Other
- Large institutional combined heat sites (apartment complexes, hospitals, universities, etc).
- Industrial boilers.

Our units work for gas engines also!

Water lowers the combustion temperature of the fuels and alters the combustion pattern to more completely burn the carbon, thereby reducing nitrous oxide and particulate matter content in the emissions.

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**EXPERIMENTAL INVESTIGATION OF THE COMBUSTION PROCESS OF NATURAL AND EMULSIFIED LIQUID FUELS**

A characteristic feature of any liquid fuel is the heterogeneity of its composition in emulsified liquid fuels.This heterogeneity is enhanced by the presence of water in emulsified liquid fuels. It affects not only such characteristics of the emulsified fuel as

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**About Water Added To Fuel**

Study of the mechanism of the process has shown that water in liquid hydrocarbon fuel, even in amounts of 50 percent by weight, when its microscopic particles are uniformly distributed in the fuel, i.e., emulsified, not only does not hinder the ignition and combustion, but, on the contrary, improves the conditions of these processes through additional breakup of

additional breakup of the droplets by the microexplosions.

the heat of combustion, theoretical temperature of combustion, viscosity, specific gravity, etc.,but also the combustion process of this fuel.

Until recently, it was believed that presence of water in fuel was a negative factor; attempts were therefore made to remove it from the fuel (especially from liquid fuel) by any possible means.

It is well known that the combustion of carbon monoxide in dry air takes place very slowly, whereas it is accelerated considerably in the presence of water vapor. There are also other instances of positive influence of the water medium (in the vapor phase); e.g., evaporation is faster in a humid than in a dry medium.

Taking this fact into account, we drew the conclusion that it might be suitable to inject water into the cylinders of internal combustion engines, in order to accelerate the evaporation of the fuel charge and thus increase the speed and extent of its combustion.

A well-emulsified mixture of liquid fuel and water constitutes a system in which the distribution of microscopically small water droplets in the fuel is fairly uniform. Such a system is very stable and is seldom disturbed over a long period, even one of several months? duration.

In addition to the study of the properties of the water-fuel emulsion and of the process of its combustion in a flow, an investigation using high-speed cenematography (200-300 frames per sec) was made into the mechanism of ignition and combustion of a single particle of emulsified fuel. Observations were made of a particle (droplet) of liquid fuel which had been introduced into a medium heated to a certain temperature.

The experiments were carried out in an experimental apparatus (Figure 2), the basic component of which was a chamber in which the droplet was placed and surrounded by air of various compositions.

The capacity of the chamber was 250 cm3 . Three windows permitted inspection in reflected and transmitted light. The experiment was conducted in the following sequence: The chamber was heated to a certain temperature. A fuel particle in the shape of a round drop 0.8-3 mm in diameter was introduced with a quartz inserter into the chamber through a cooled channel. The particle was placed at a point within the field of vision of the objective of the motion picture camera, which was turned on before the particle reached the point on which the objective was focused. This permitted a determination of all the changes undergone by the fuel particle after its penetration into the heated air from the very start of its transformations. At the end of the combustion process, the combustion products were evacuated from the chamber by means of a water-jet pump.

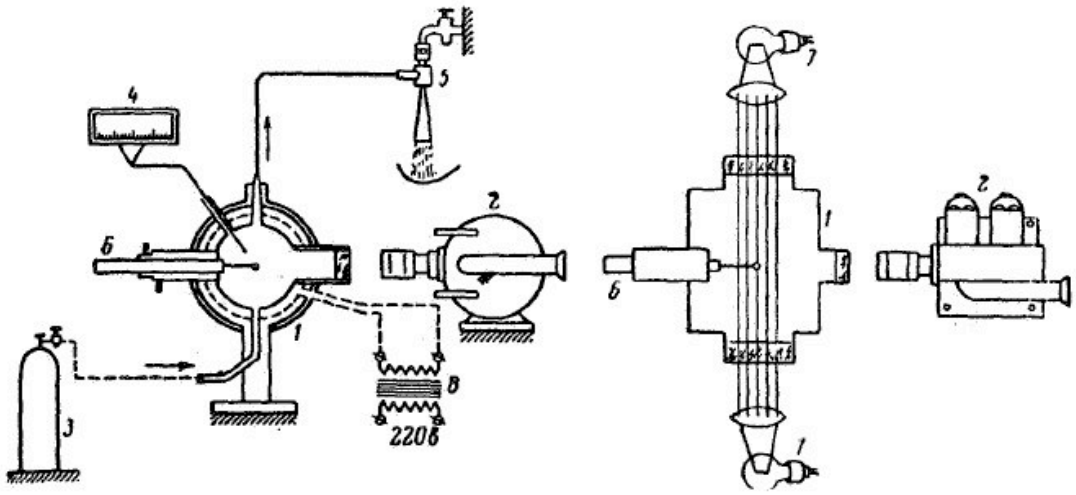


Figure 2. Schematic drawing of the experimental setup

- 1 - Chamber (heated)
- 2 - Motion picture camera
- 3 - Gas cylinder
- 4 - Millivoltmeter
- 5 - Water-jet pump
- 6 - Support for droplet
- 7 - Illuminators
- 8 - Current source

The filming made it possible to obtain an interesting qualitative picture of the ignition and combustion processes of a single particle of water-oil emulsion and to clarify the characteristics of this process in comparison with that of anhydrous oil particles.

It is known that when a fuel particle is inserted into a high temperature zone it will undergo a series of physicochemical changes. The following was established in the course of the investigation: the pure oil particle, introduced into the heated zone of air, began, after a certain period of warming, to evaporate from the surface. The vapors of the lightest fractions of hydrocarbons, having reached a sufficent concentration above the surface of the particle, ignited. From this moment on the process of fuel combustion started around the vapor phase of the particle.In the relatively immobile medium, a typical diffusion process of droplet combustion took place.

The motion picture film of the ignition and combustion process of the pure anhydrous oil particle (Figure 3) provides a graphic representation of the course of the process. The time interval between the frames is 0.0025 sec. The upper part of the photograph shows enlargements of the second and third frames of the film.

Let us examine the beginning of the process. The focus of ignition formed around the droplet (see the second. frame from the right) is characteristic of the ignition of a gaseous mixture (in this case, a mixture of air and hydrocarbon vapors formed around the particle) . The ignited hydrocarbon vapors promoted a more vigorous vaporization and combustion of particles.

Of a somewhat different character are the changes of a particle of the water-oil emulsion during ignition and combustion. Figure 4 shows a filming of the ignition and combustion process of a particle of a water-mazut emulsion with a 30 percent water content. The time interval between frames is 0.003 sec. The top of the photograph shows enlargements of the third and fourth frames of the film.

It is apparent from the film that the course of ignition of the emulsion particle is quite different from that of pure oil. The bright local focuses of combustion, visible on the sides of the particle in the third and fourth frames, show the ignition of the mixture of hydrocarbon vapors and air taking place around a number of smaller particles, which have been split off from the original droplet. The recorded time shows that, the temperature conditions being the same, the ignition of the vapors from the emulsion particle of water-containing oil takes place earlier than that of the particle of pure dehydrated oil.

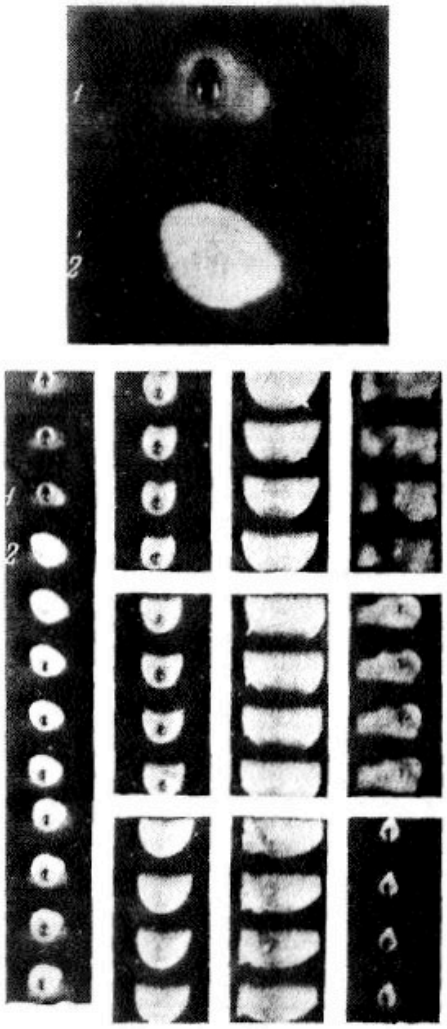


Figure 3. Motion picture film of the ignition and combustion process of a pure oil particle. Time interval between frames: 0.0025 sec. Figures 1 and 2 indicate the start of ignition. Enlargements of frames 1 and 2 are shown at top.(Sequence of frames: from top left down). End of quartz support is visible in the last frames.

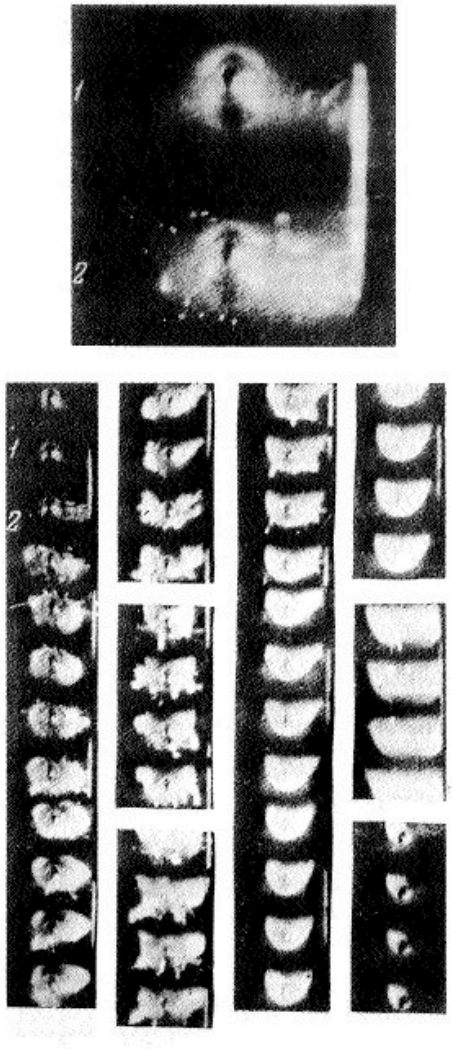


Figure 4. Motion picture film of the ignition and combustion process of a particle 30 percent water-oil emulsion. Time interval between frames: 0.003 sec. Figures 1 and 2 indicate the start of ignition. Enlargements of frames 1 and 2 are shown at top. (Sequence of frames: from top left down). End of quartz support is visible in the last frames.

Moreover, as seen from the film, the combustion process of the emulsion is accompanied by bursts on the surface of the particles by the ejection of vapors. The emulsion particle burns out faster than a particle of pure oil of the same size, because of the breakup of the droplet effected by these "microexplosions". It has been established experimentally that the oil emulsion particles start boiling some time before ignition. In order to determine the time at which the particles of oil emulsion and pure oil begin t o boil, observations were undertaken in a neutral medium (nitrogen) in the temperature range between 300c and 800c.

These observations also showed that in a heated medium the emulsified oil particle begins to boil earlier and at a lower temperature.

One characteristic of the oil emulsion particle was clearly observed: the presence of two stages of boiling. The first stage consists of the boiling and bursts produced by the water of the particle, owing to the different boiling points of water and oil. The heated water present in the emulsified particle starts boiling and evaporating earlier than the oil. The water vapor ruptures the superficial film with violence and breaks up the combustible substance of the droplet. After evaporation of all the water from the particle, only the dehydrated oil remains, which continues to heat, up to its boiling point,and the particle boils for the second time. The same sequence was observed in the combustion process of the emulsion (Figure 5). It is apparent from Figure 4 that-the steam bursts the surface film. The droplet is thus broken up into smaller fuel

particles, gaining more speed in relation to the heated medium and evaporating and igniting faster, bringing about an intensification of the combustion process. During combustion of the oil emulsion particle, its breakup continues, until all of the water has evaporated. This phenomenon, which we have observed earlier, was called a "microexplosion". The combustion of the oil emulsion particle is schematically presented in Figure 5.

Thus, the microscopic water particles present in the emulsified oil cause an additional breaking up of its droplets into smaller particles and thus promote a better mixing with the oxidant and a more complete combustion.

This important feature not only accelerates the combustion process of the fuel, but also permits the reduction of the excess air coefficient to a minimum value (a = 1.05 - 1.O7), the extent of combustion being the same. This mechanism which we have observed in the behavior and combustion of emulsified, water-containing liquid fuel, also takes place in actual furnace units.

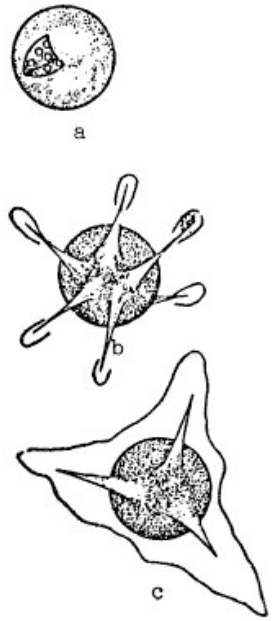


Figure 5. Schematic drawing of the ignition and combustion of a particle of water oil emulsion, a) microscopic water droplets in oil envelope; b) injections of oil particles; c) evaporation and combustion during breakup of emulsion

This explains the intensification of the combustion process observed when emulsified water-containing liquid fuels are used in furnaces, engines, stoves and other thermal units.

The catalytic influence of water vapor may also be manifested in the final stage of combustion of heavy liquid fuels and in the final burning off of carbonaceous residue. Observations of the ignition and combustion of an emulsified droplet of kerosene or diesel, a fuel lighter than oil, has shown that the process involves the same two stages and that the combustion takes place with the same microexplosions which were seen in the combustion of the oil emulsion droplet.

Study of the mechanism of the process has shown that water in liquid hydrocarbon fuel, even in amounts of 50 percent by weight, when its microscopic particles are uniformly distributed in the fuel, i.e., emulsified, not only does not hinder the ignition and combustion, but, on the contrary, improves the conditions of these processes through additional breakup of the droplets by the microexplosions described.

Typical oscillograms of the temperature recorded inside a droplet of oil, oil emulsion, kerosene emulsion, and emulsion of gaseous benzine, obtained by experiments of this kind, were obtained. The examination of the combustion process of the fuel droplets was conducted at an air temperature of 500c-860c in a medium of low mobility with

simultaneous radiation of the chamber walls. The fuels used were: kerosene, heavy oil, and also emulsions of gaseous benzine, kerosene and oil, containing 20-40 percent water.

Droplets 0.8-3.0 mm in diameter were used in the experiments; the diameter was determined with a microscope provided with an ocular micrometer. A detailed study of single droplets during the combustion process confirmed the above-indicated essential difference in the combustion processes of anhydrous and emulsified water-containing fuel, and clarified some qualitative characteristics of this difference. In addition, these experiments provided a clear picture of the combustion of heavy liquid fuels with or without water, and also permitted the establishment of the difference in the combustion of heavy oil, medium (kerosene) and light (gaseous benzine) fuels. These experiments confirmed that the combustion process of heavy liquid fuels consists of the following basic stages: heating and vaporization of the particles, ignition and combustion of the fuel vapor with simultaneous pyrolysis (thermal dissociation) of the heavy hydrocarbons in the vapor phase, deposition of free carbon, and finally, heating and burning of the carbonaceous residue (soot).

Combustion of the water-emulsified fuel takes place in the same sequence, except that microexplosions of the particles precede the ignition of the fumes of heavy fuel; the combustion of the emulsion of the middle fuel is more vigorous and quicker than the combustion of the same fuels not emulsified with water.

The rise in the temperature of the liquid phase in the course of vaporization and combustion of the drops indicates a successive fractional vaporization first of the light, then of the heavier hydrocarbons which have correspondingly higher vaporization temperatures. Measurement of the temperature of the liquid phase of the drops combined with motion pictures, made it possible to follow the various phases of the process, to determine their duration, and to identify certain quantitative characteristics which distinguish the combustion of the emulsion from that of anhydrous fuels.

The described phenomena of the formation of sooty residues, which have been observed in our experiments during the combustion of single droplets and of groups, are by no means a coincidence; they also take place in internal combustion engines, boilers, furnaces and other thermal units. In motors this phenomenon is called scale formation.

The characteristic difference between the combustion of emulsified and anhydrous oil, observed in single droplets, remains valid in groups of droplets. The whole combustion process of a group of emulsified droplets consists of identical stages: heating and evaporation, explosions, combustion of vapors, including cracking of hydrocarbons, and the final stage--the burning of the sooty residue. The Combustion of the group of emulsion droplets takes place as vigorously as that of the anhydrous oil, only more rapidly.

Thus, our study on the combustion of droplets, undertaken with the single aim of establishing the difference between the combustion of natural anhydrous and water-containing emulsified fuel, answered not only the question asked, but also clarified several other general problems concerning the combustion of liquid fuel. Simultaneous application of filming and temperature measurement of the liquid phase of burning droplets within the range of the combustion of the fumes made it possible to establish definitely, that combustion of liquid fuel must not be deemed as simple as is done by some researchers; that the whole combustion process of atomized fuel in flow must not be reduced to the pattern of diffusional combustion of the single droplet or the process reduced to only one stage, that of evaporation, or only to the combustion of a separate droplet. The combustion of liquid fuel is actually a very complex process consisting of the stages described above.

These stages, although taking place in definite sequence, overlap each other in time and space. Hence, the duration of the combustion process, as a whole, may also vary, depending upon the conditions of the given apparatus and, of course, on the type of the fuel itself.

**The results of the comparison of the combustion of anhydrous and water**

**emulsified liquid fuels have proved the following:**

- 1. Emulsified liquid fuels burn faster than anhydrous ones.

- 2. Water in emulsified fuels does not impair, but improves the combustion process, owing to the additional simultaneous breaking of the droplets to the increase in the evaporation surface of the droplets, and to a better mixing of the burning substance with air.

- 3. The reduction of the combustion time of emulsified fuels has a favorable influence on the burning of the sooty residue, thus improving the completeness of the fuel combustion and reducing the deposition of soot (scale) on the working surfaces.

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- Methane From Manure... 48 pages
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- Ethanol Industry Contacts... 12 pages
- Handbook of downdraft gasifier systems for engines... 148 pages
- Biodiesel Industry Contacts... 5 pages
- Plasmatron Fuel Reformer... 8 pages and 15 pages
- BioMass Gasification... 105 pages
- Water Fuel
- Pogue Carburetor ... Rumored 200 mpg.. see what you think
- Hydro-Gen Hydroxy Unit ... Poor Unit. Just included here so you can see how not to make it
- Hydrostar Hydroxy Unit ... Another Poor Unit. Included here so you can see how not to make it
- Smack Booster ... This is a good one you can build
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