Removing Emulsified Oil from Water*

The Treatment of Condensed Water for Re-use in the Boiler

By Darrow Sage

UNLESS one has had personal experience with the difficulties met with in removing emulsified oil from condensed water, he can hardly appreciate the persistency with which the oil sticks to the water. Water which in the form of steam has passed through the cylinders and steam valves of engines and pumps lubricated with cylinder oil, carries with it all the oil that has passed into the cylinders, some of it in the form of drops or small globules of pure oil and the remainder in the form of emulsified or finely divided oil in suspension. The emulsified oil gives the water a milky appearance similar in appearance to water that contains a quantity of air in suspension. In the case of emulsification this milky appearance does not leave the water, as when it is filled with air, and the oil cannot be filtered out by ordinary methods. This finely divided oil must not be confused with the drops of oil above mentioned, which are often seen floating on the surface of water condensed from exhaust steam, as these drops of oil may easily be removed from the water by collecting the mixture in a settling tank from which the water still carrying the emulsified oil can be drawn off at the bottom.

The removal of the emulsified oil to render the water suitable for re-use in the boilers is the real problem. At present there are three well known methods of removing this emulsion, namely:

- (a) Filtration through certain kinds of natural sand or crushed stone.
- (b) Electrical treatment.
- (c) Chemical treatment.

Each of these methods has its particular field, depending upon local conditions and plant equipment. Only the chemical method will be described here.

The commercial name of the chemical used in this

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process is ferric alum (ferric ammonium sulfate). This ferric alum comes in the form of lumps or crystals having a peculiar bluish tinge which turns to a brownish-yellow color after the exposure to the air. It is easily soluble in water and this property is used to introduce the proper quantity into the water to be purified. From experience it has been learned that about 4 pounds of ferric alum will successfully clarify 10,000 cubic feet of emulsified oil and water, and if this water is recovered at the rate of, say, 4,200 cubic feet per hour, the ferric alum should be added uniformly at a proportional rate. Not only must the rate of flow of the water and ferric alum be uniform, but care must be taken to see that the chemical is thoroughly mixed with the water to be treated.

A convenient way of doing this is to dissolve the necessary amount of ferric alum to last about 24 hours in a barrel of water and permit his solution to flow or drip into the tank in which the return water is caught before it is pumped to the filter, as will be explained later. In making the ferric-alum solution, care must be taken not to produce too strong a mixture, as a saturated solution of this chemical in water is very corrosive. It should never be mixed in greater proportions than 2 pounds to the barrel of water of about 50 gallons and where conditions will permit, less than this. As soon as the ferric-alum solution and the water under treatment have been thoroughly mixed, a pronounced change can be noticed in the milky appearance of the water. It is caused by the action of the ferric alum, which coagulates the minute particles of oil suspended in the water, and thus produces a change that cannot be easily described but can be quickly detected.

After the action of the chemical has taken place the mixture is ready for filtration.

A filter for this purpose can be made from an ordi-

nary tank partially filled with coarse, clean sand which has sufficient area to permit a flow not exceeding 15 cubic feet per hour per square foot of sand bed. The sand bed should be about 2 or 3 feet thick and the sides of the tank must extend above the top of the bed a sufficient distance to provide a separating space for the floating oil. Into this filter the water treated with the ferric-alum solution should be pumped and properly scattered about the surface of the sand bed so as not to wash holes therein and be allowed to pass out at the bottom of the bed through screens and perforated pipes to keep the sand back. The emulsified oil being properly coagulated, it will be caught by the sand and from the discharge of the filter clear water practically free from oil will be obtained. Where it is possible to arrange the filter so that the overflow can be caught, the drops of oil and coagulated scum can be washed out of the filter by simply shutting the discharge valve from the bottom of the tank and permitting the filter to overflow its sides. The floating oil can in this way be skimmed from the top of the tank at regular intervals, but its use as a lubricant is not advisable. By this method the cleaning of the sand bed can be materially postponed, thus getting the equivalent of a longer life out of the filter. With a filter as above described, cleaning will be necessary about every 30 days when working up to its full capacity, it being assumed that there is no more than a normal quantity of oil in the water which passes through the filter.

The cost of operation of a filter plant of this size is small compared to the value of water saved, as the present price of ferric alum is about 20 cents per pound and the cost of saving 10,000 cubic feet of water would be 80 cents plus the cost of the pumping and whatever slight attendance that is necessary to operate the pump and keep it in good condition.

The Future of the Aeroplane in Army Service

By the Paris Correspondent of the Scientific American

THE leading Paris journal *Le Matin*, makes the following observations regarding the future of the aeroplane for army use. The military maneuvers which have just closed are an abundant proof of the value of the aeroplane, even when we consider the question very soberly and without any undue enthusiasm, as the facts speak for themselves. In time of war, the aeroplane will be the most rapid messenger which a general will have at his disposal. In fact, in seven minutes Lieut. Blard carried an order from Villersexel to Vesoul, a distance of 17 miles. Legagneux carried orders from Hericourt to Besancon, about 30 miles, in a very strong wind in 25 minutes. This would have been quite beyond the powers of an automobile, to say nothing of the fact that an automobile could not pass over roads covered with infantry or artillery, or across fields, ravines or woods. And we must remember that the usual front of an army corps during battle extends over five miles; moreover, two or three corps may be lined up together, making a line of fifteen miles. A general may need to send an important order to the end of the line, and here the best means will be the aeroplane.

Scouting is the next great service the flying machine will render, and it will be hard if not impossible for the enemy to conceal his movements. No advance guard can give such complete information as to the positions taken by the enemy, the strength of his forces and the location of the batteries. Another duty that will fall to the lot of the aeroplane is to direct the artillery fire. Obstacles in the way often prevent any kind of accurate fire, but this difficulty will disappear with the use of the aeroplane. Artillery assisted by trained aviators will no longer be hindered by topographical obstructions, but will hit the mark with high percentage.

The utility of the aeroplane for dropping bombs upon the enemy has been disputed. But it appears certain that during the French army maneuvers the aeroplanes could have dropped shells which would have caused much damage, not only to the army but also to railroads and bridges.

It was also observed that the aeroplane camps could be quickly moved from one place to another, for instance on one occasion Capt. Bellanger received orders to take up his camp and simulate a retreat at night. He dismounted the aeroplanes in less than three-quarters

of an hour and stowed them in the large wagons invented by Capt. Duperron, together with all the repair material, and made the retreat along the route to St. Julien at 20 miles from there. At this point he set up his camp and unloaded the aeroplanes, put them together and the next morning the aviator made flights through the region.

This will give an idea of what may be expected of the aeroplanes, but it now remains to organize the forces in the best manner so as to make them as effective as possible, seeing that an army which possesses the best organized aeroplane service will have a great advantage. It is evident that the aeroplane service should cease to be a separate organization apart from the army and headed by a few persons. In France the great unit of combat is the army corps, and each corps just as it has its infantry, cavalry, and artillery, should have its aeroplanes which move with it at all times and in fact form part of the corps. For the twenty present army corps there should be as many aeroplane corps and each should be under the exclusive command of the general of the corps. In each case several classes of aeroplanes are needed, firstly, for carrying messages; secondly, for scouting in each division, and thirdly, to accompany the artillery and guide its fire. An aeroplane for each battery would be excellent. Another point is to provide destructive aeroplanes.

Such aeroplanes should be chosen only from among a few leading types which are well known for their good performance. Another point is to establish military aviation schools which are distinct from the aeroplane centers of the army, either a single large institution as Col. Hirschauer proposes, or several as recommended by Col. Estienne. After passing through the aeroplane school the pilot receives his diploma, and not until then is he placed under the army chief. These various points show that the matter of army aeroplanes is already well advanced in France. The progress which has been made since last year's maneuvers is very evident. Last year there were but very few aviators, and they acted more or less as amateurs upon their own initiative. This year the army had over twenty aeroplanes, and they carried out orders very strictly, even in very bad weather, and showed what could be done when aeroplane service is organized on a large scale.

Armored Macadam

THE French engineer, M. Guet, has for some two years past been making experiments with a new road material, with results which, according to the *Revue Scientifique*, have been eminently satisfactory. The material is prepared in rectangular plates of varying sizes and is built up of three superposed layers. The lowermost layer is made of cement concrete, the middle layer, which receives flat and circular iron reinforcing pieces, consists of cement alone, and the third, upper layer is formed of broken stone pressed into the cement layer. A pavement of this kind is not only highly resistant against wear by heavy and rapid traffic but also offers a very smooth surface, thus giving the vehicles a smoother motion than can be attained with stone pavement. For this reason the inventor proposes that in cases where the new material would be too expensive, there should be at least a track of the material laid, to accommodate the wheels of the vehicles. A plate made of the new material and measuring 19 inches in breadth and 28 inches in length will support a uniformly distributed load of 30 tons, without breaking, and a load concentrated at one point, up to eight tons.

A plastic mass which is easily worked and molded, and also after molding, remains soft and plastic, but is not moist and can readily be colored, is plastilina. According to experiments there was obtained, by melting together wax, sulphur, and olive oil and kneading up the materials with zinc-white and finally pulverized, rich clay, a moldable, form-retaining and dry mass. This can readily be colored by the admixture of any desired fine mineral colors. The mass carried a fine wax polish. Where a more marked polish is desired it can be obtained by subsequent coating with celluloid varnish, shellac or ordinary clear spirit varnish. The exact mixing proportions of the mass described must be tested out. The approximate quantities are: Wax, about 50 parts; zinc-white, about 20 parts; sulphur, oil and clay, each about 10 parts. If the mass gets too hard, a little more oil and less sulphur and clay may be used. A similar product is obtained by mixing finely pulverized clay with glycerine in place of water.—*Techn. Rundschau*.