FILE NAME: Foster Wheeler (FW)

DATE: 1939 Sept

DOC#: FW015

DOCUMENT DESCRIPTION: Trade Journal Article - Dust in the Boiler House - Engineering and Boiler House Review

ENGINEERING and BOILER HOUSE REVIEW

ESTABLISHED 1899

Vol. 53 No. 3 PUBLISHED MONTHLY SEPTEMBER, 1939

18

Second Progress Report of Welding Research Committee

BESIDES the Research stations which are controlled and financed directly by the Department of Scientific and Industrial Research, encouragement has been given by the Department to the formation of a number of industrial research organisations which are financed principally by a particular industry and receive a *pro rata* subsidy from Government Funds. The newest research association to be formed, the Research Committee of the Institute of Welding has now issued its second annual progress report. This document describes the work carried out to date in formulating the many and varied problems which require experimental investigation and some of the details of the work which is in progress. All three methods of welding are being considered, namely, arc, gas and resistance welding.

The problems which are being investigated may be broadly classified under the "weldability of metals" and "welded construction." Among the former, investigations are in hand to determine method of welding both the ferrous and the non-ferrous metals which are produced commercially at the present time so that specifications for materials suitable for welding may be drawn up. The items under welded construction include ship structures, frame structures, plate girder bridges, and structural details, machinery and pressure vessels. Work is also being undertaken on the resistance welding of steel, light alloys and stainless steel and on projection welding.

The work of each Committee is described separately in Part II, which follows a statement on the need for the research work. The personnel of the Committees, and contributors to the research funds and other items of interest are listed in appendices. The report is obtainable on application to the Institute of Welding, 2 Victoria Street, London, S.W.1.

Mr. W. G. Girling joins Board of General Refractories Ltd.

AN appointment of interest in the refractory world is that of Mr. W. G. Girling, Vice-Chairman and Managing Director of Henry Foster and Co. Ltd. He is appointed a Director of General Refractories Ltd., of Genefax House, Sheffield, and also of the Glenboig Union Fire Clay Co. Ltd., of Scotland. Messrs. Henry Foster and Co. Ltd., are an associated company of General Refractories, and Mr. Girling has had a lifelong association with the refractories industry. The company with which in the past he has primarily been interested is well known for blast furnace linings. Messrs. General Refractories claim that they are the only firm in this country manufacturing all types of heat and acid resisting materials.

Mr. Wilfrid R. Wood

THE recent death of Mr. W. R. Wood will be felt with regret by all those in the steam engineering field and elsewhere who were acquainted with him. It took place in New York on July 14th, after a long and distinguished career in combustion engineering. The name of the Underfeed Stoker Company was, during the whole of its existence, associated with Mr. Wood from the year 1899 when he arrived in this country to take an active part in its formation. He had come from the American Stoker Company and successively held the positions at the Underfeed Stoker Company of general manager, managing director and chairman.

He first designed the well-known class B underfeed stoker for flue type boilers which has been made in hundreds and which is still being manufactured, and then the retort type stoker of which the type E steam operated model was conspicuous by its success for moderate sized water tube boilers of up to 20,000 lb./hour evaporation. Later he brought out the well-known A type travelling grate stoker of which large numbers were manufactured and which gave very satisfactory results within certain limitations of the type and size. It was not until some 15 years ago that the constantly increasing dimensions of water tube boilers outgrew the A type stoker and this was eventually superseded by the well-known L type louvre stoker.

An original and successful innovation by Mr. Wood was the self-contained A stoker on which were mounted both the fans and the motors for driving them and the stoker itself, thus constituting an entirely self-contained unit which could be withdrawn from the boiler without any dismantling being required.

Mr. Wood's long career was distinguished by a most attractive personality and also a remarkable sense of humour and a capacity for concentrated effort, which made association with him both strenuous and inspiriting as well as being an education. Yachting and golf were hobbies which he followed with enthusiasm.

Towards the latter end of his association with the Underfeed Stoker Company and prior to the formation of the International Combustion Company, he did much work with the early development of pulverised fuel in this country and also developed the Wood radiant heat steam generator, the essential features of which appear in more recent designs. After the Underfeed Stoker Company was combined with the International Combustion Limited Mr. Wood went to America, and the last few years of his business life were in association with the International Combustion Corporation of New York.

WITHOUT ASSUMING ANY LIABILITY FOR THE CORRECTNESS AND SUBJECT TO COMPARISON WITH THE ORIGINAL THE WITHIN PHOTO PRINT IS ... TO BE A TRUE COPY OF PAGE ... VOL. ...

L. Bamfield

ENGINEERING SOCIETIES LIBRARY
NEW YORK

A PORTABLE BOILER UNIT *Concluded*

And this has, we understand, been confirmed at the annual inspection.

This experimental boiler has now been operating for about four years for long periods and has given satisfactory results. During this time it has been examined by the insurance company three times, and the tubes have been drained and internal parts have been withdrawn and reinserted by the staff at the Polytechnic Institute without difficulty. We understand that each annual report has been perfectly satisfactory, and the Head of the Civil Mechanical Engineering Department of the Institute has reported that it continues to give satisfactory service. The working pressure is 200 pounds in spite of varying loads, rapid raising of steam and also frequent application of experimental baffles amongst the tubes, they have all remained tight and free from leakage.

An interesting example of a development in the Lewis boiler is its application to a mobile steam turbo-electric pumping unit on order for A.R.P. water works emergency services by one of the leading water companies in the neighbourhood of London. This is a single drum boiler, very light and compact, and mounted on a four-wheel trailer 7 ft. 6 in. wide, and 12 ft. long, with space provided for the feed pump, tank and two short natural draught chimneys. The total weight of this equipment is less than 10 tons, but the capacity of the boiler is 6,000 pounds per hour, at 185 pounds pressure when fired with coal on a hand-fired Turbine furnace. Steam jets are installed to provide forced draught, and the resistance through the nests of tubes is designed to be low enough for the draught available from the short chimneys.

This single boiler unit is primarily for operating turbo-generators for driving electrically operated pumps in A.R.P. water works service. The amount of water pumped is sufficient to provide circulating water for condensing the steam used in the turbine, and consequently, condensate feed for the boiler. The weight and dimensions of the vehicle are such that it can be employed on the public roads at speeds of up to 15 m.p.h., attached as a trailer to any power driven commercial vehicle, and will comply with the Roads Act in that no special notification for its use is required.

This unit is now being constructed by Messrs. Danks of Netherton Limited, for the Ricksmansworth and Uxbridge Valley Water Company. Mr. L. F. Hobbs, B.Sc., A.M.Inst.C.E., is the engineer to the water company, and Mr. Yorath Lewis was appointed general contractor for the complete equipment.

Finally, it is stated that this boiler can be constructed for any desired out-put of steam at pressures up to 3,000 pounds per sq. in., and final temperatures of 85° F. from the smallest size boiler for factory heating to the larger sizes likely to be required in large power stations.

WITHOUT ASSUMING ANY LIABILITY FOR CORRECTNESS AND SUBJECT TO COMPARISON WITH THE ORIGINAL THE WITHIN PHOTO P. TO BE A TRUE COPY OF PAGE VOL.
L. Bamfield
ENGINEERING SOCIETIES LIBRARY

Dust in the Boiler House

By J. M. SOESAN, B.Sc.

DUST, perhaps the greatest scourge of civilisation, receives little attention until its presence becomes liable to cause immediate catastrophe. The few who have undertaken to study the subject have been able to show vividly the dangers and destruction caused by dust, have been able to explain the numerous phenomena it manifests and have even to a small extent suggested means for abating the nuisance, but there are few means of removing dust from the atmosphere although methods of preventing the liberation of dust are numerous and fairly efficient. It is the object of this brief article to show the part that dust plays in and around boiler houses with the hope that it will render more engineers "dust-conscious." Many of the things to be said will appear self evident, but it is the very abundancy of dust and the very familiarity of its effects which causes all but a few to take it for granted and cease further investigation.

Before considering the particular presence of dust in boiler houses it will be advantageous to give a brief summary of the properties of dusts in general. Dust can be divided into three classes according to the size of the particles. There are the comparatively large particles which obey the law of gravity and fall to the earth with an accelerating velocity. These particles quickly settle out especially in the absence of winds or other air movements, such as those caused by fans. They are perhaps the least dangerous and most easily removed dusts since they can be collected on settling and thus removed completely from the atmosphere. Their presence is usually easily detected because, even if they are not large enough to be actually seen, the film of dust which they deposit on objects in their neighbourhood is only too easily apparent.

The second class of dust is of a range of sizes smaller than the first so that they obey Stoke's law rather than the law of gravity. Thus they tend to settle at a uniform velocity. It is apparent that such dust will remain in the atmosphere for longer periods and will, owing to general air movements, settle farther from its place of origin than the larger dust. Its wider range of activities and longer period in the atmosphere makes it more dangerous and less easy to remove.

The last class of dust comprises those particles which are so small that, being affected by the impact of molecules of the gases which make up the air, they obey Cunningham's law and fall to earth with a decreasing velocity so that in actual fact they never settle. These particles form the bulk of the solid matter permanently present in the atmosphere. They cannot be removed by filtration and it is doubtful whether other processes such as electrostatic precipitation or washing affect to any appreciable extent their concentration in the treated air.

The first thing to be considered when reviewing dust in relation to boiler houses and their attendant plant is its effect on the layout and general situation of such plant. In choosing a site it will obviously be advantageous to choose one outside the dust radius of other factories especially those emitting dust of a corrosive nature. If this is impossible, sites in such a position that the prevailing winds tend to blow the dust emitted by local factories away from the plant are to be preferred. Such precautions are especially important when boiler water is drawn from open softeners which are continually contaminated by a dusty atmosphere. Again, when considering the position of such a softener in relation to the rest of the plant a study of dust movements is of value. The best position is immediately adjacent to the base of the stack, for around here little dust actually

DUST IN THE BOILER HOUSE—*Concluded*

settles. Wind movements and the momentum of the dust carry all but the heaviest particles some distance from the stack before they settle.

The effect of storing coal in the open, especially when it is built up into high mounds directly in the path of winds, is to add a continuous supply of fine coal dust to the atmosphere surrounding the plant. The quantity of dust removed from the field is greater the smaller the coal, and with fine slacks such as are used on pulverised fuel plant the loss in weight over a long period of time adds in a very appreciable way to the loss caused by deterioration of the coal. Since storage of coal for long periods in enclosed spaces is dangerous, the only solution to this particular problem is storage under water. The initial cost and cost of drying are more than offset in big undertakings by the prevention of deterioration of the heating value of the coal and of actual loss by dust formation, to say nothing of the prevention of outbreaks of fire which are liable to occur in even the best ventilated storage fields. Where, however, coal has to be stored in open fields it is clearly best to arrange the position of the field so that the prevailing winds blow the dust away from the boiler houses and not into them. This precautionary measure will preserve the buildings in a clean state and give better working conditions to the staff, and is well worth consideration when initially laying out plant.

Inside the boiler house the problem of dust is even more acute. Here the dust is composed almost wholly of coal dust and flue dust. While the former is the more dangerous as regards inflammability, the latter is usually smaller and therefore less easy to remove and more troublesome to those who have to work in its proximity. However, even flue dust is a potential source of danger if allowed to collect, especially when boilers are being run short of air and anything up to 30 per cent. of unburnt carbon may be present. The bagging of flue dust collected from pulverised fuel boilers should always be done outside the boiler house. This is usually the case when a Lodge-Cottrell or similar precipitator is employed but where precipitation of the flue dust is accomplished in a specially designed stack the dust is usually run off and bagged in the boiler house. This is to be deprecated unless some adaptor is employed whereby the dust runs into the bags without being free to rise into the air. The bagging and transport of flue dust in and around boiler houses gives rise to that ever present grey film on the outside walls and boilers and auxiliary plant and renders the constant use of a vacuum cleaner necessary.

The danger from coal dust increases with decreasing size of the particles and with very fine particles of a size such that they remain suspended in the air for a long time, as little as a third of an ounce per 32 cub. ft. of air will be capable of explosion. Such and bigger concentrations are to be found in many boiler houses, e.g., where pulverised fuel units are employed and through faulty maintenance and inspection develop crevices through which the finer particles easily escape, or where coal is fed to chain grate stokers by a system which is open at some point, e.g., the automatic weighing machines and in which the coal falls under gravity and raises clouds of dust on doing so. This fine coal dust is especially dangerous if it is allowed to settle on hot water pipes or steam pipes. The action of the heat is to cake the dust so that after a time quite thick layers of warm finely divided but closely packed coal dust are built up. Such accumulations can be fired in a variety of accidental ways. A few drops of water for example will react with the very dry coal to give out sufficient heat to ignite it. A hard metallic object dropped on the pipe will simultaneously raise a cloud of fine dry dust and supply the spark necessary for ignition. Greasy rags, which are always to be found in boiler houses left lying on such dry coal will almost certainly result in ignition owing to the pyrophoric nature of a mixture of coal and oil.

Other dusts which add their presence in small quantities to the flue and coal dust always present in boiler houses are chemical dusts. These may be supplied in liberal quantities when water softening materials such as lime and caustic soda are stored and measured out in the boiler house. It is a good plan to keep such materials in a small shed built for the purpose so that they do not add more than is necessary to the dust content of the air in and around the boiler house.

Although this question of dust may appear to be an insignificant problem the writer suggests that a little more consideration to it when planning the layout of a boiler house and its auxiliary plant would add, in no mean way, to the general efficiency of the plant by cutting down cleaning costs and also add to its safe working.

Glass Silk Insulation

ONE of the most interesting, and from the thermal insulation engineer's point of view, important of modern industries, is the manufacture of glass silk for the conservation of heat, cold and sound. Of these, perhaps the chief application is for heat insulation. Glass silk consists of long, thin, flexible fibres of glass of predetermined diameter, which are continually drawn from the furnace whilst the glass is still in a plastic condition.

An insulating material depends for its efficiency on the number and size of air cells which can be enveloped in a given space, and these in turn determine the amount of heat dissipated by conduction, convection and radiation.

Glass withstands temperatures met with in steam engineering, [illegible] acids and alkalis, with the exception of hydro[illegible] is inert and therefore most suitable as a [illegible] air cells.

On the other hand, convection of the air in these cells plays an [illegible] air cells are large, air will circulate freely and in doing so, will carry heat from the hotter to the cooler side. This heat in turn will be readily conducted through the glass fibre to the adjacent cell and the process repeated. If, however, the cells can be made small enough, convection currents and their resultant heat transfer will cease, therefore from the point of view of convection the cells should be made infinitely small. Actually in the finished form of glass silk insulation the volume occupied by glass is only about 5 per cent. of the total volume.

The rate of radiation, however, depends upon the nature of the radiating surface and the distance through which the heat must be transferred. The larger the cells, therefore, the less the amount of heat radiated. It is obvious from the foregoing that some maximum cell dimensions exist where the combined effect of convection and radiation is a minimum. This is confirmed in practice, the actual density to give the minimum heat transfer being in the neighbourhood of 9 lb./cub. ft.

Finally, glass silk will withstand temperatures up to 900° F. *without* any preliminary protective heat resisting cement. For higher temperatures an air space is recommended; its efficiency is high at medium temperatures.

WITHOUT ASSUMING ANY LIABILITY FOR ITS CORRECTNESS IN COMPARISON WITH THE ORIGINAL THE WITHIN PHOTO-PRINT IS CERTIFIED TO BE A TRUE COPY OF PAGE
R. Banfield
ENGINEERING SOCIETIES LIBRARY