PRODUCER GAS PLANT PRACTICE.*

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I shall not attempt to more than very briefly touch on the history of producer gas. You have probably heard it so often that, although a fascinating story, it will not bear repetition.

Sir William Siemens first utilized producer gas in connection with steel furnaces and industrial application of gas firing, and actually previous to 1878 attempted to utilize it in gas engines. He failed for two reasons:—

1. The gas made in his producer was too poor in quality to be fired by engines using the compressions at that time available.

2. He had not solved the problem of cleaning the gas.

Mr. T. Emerson Dowson, in 1878, secured a patent covering a producer, which overcame the first mistake made by Siemens by the addition of steam to the air which passed through the incandescent coal, and so raised the quality of the gas from 80 B.t.u. to 130 B.t.u. per cubic foot.

The second mistake was overcome by a compromise. He confined his plant to the use of fuels free from tar, such as hand-picked anthracite and gas-house coke. This plant was the first really serviceable equipment for supplying producer gas to gas engines.

I will now give you the chemical constitution of producer gas and a short description of its manufacture, which is commonly applicable to all the different styles of plants put on the market by the different well-known makers.

The chemical reaction is as follows:—

(1) $C+O_2=CO_2$. (2) $C+CO_2=2CO$. (3) $C+H_2O=H_2+CO$.

These reactions take place in the order given, the first at the bottom of the fire, the second in the hottest part, about seven inches higher up.

In order to obtain the above results a temperature of about 500° C. at the bottom of the fire and 1,000° C. a little higher is necessary In short, producer gas is the result of passing a mixture of steam and air through incandescent fuel, and the quality of the gas obtained depends on variations in the process.

I shall not touch on the two other gases chiefly met with, namely, Town's gas and water gas, except to say that the first is made by the destructive distillation of coal in a closed retort, and the second by blowing steam through incandescent fuel, with decomposition of the same, the incandescence being produced by combustion of the fuel with an air blast, and the blowing and steaming periods being intermittent.

Producer Gas.

The gas of which we are talking can be roughly described as being made by one of three processes:—

1. By the piston of a gas engine aspirating the gas from a producer direct without any intermediate storage or gas-holder. The resultant gas is known as suction gas.

2. By the action of a roots or other type of blower placed between the producer and the point at which the gas is to be used. The blower draws the gas under less than atmospheric pressure and delivers it under pressure. This is called a suction pressure plant.

3. By the action of a positive blower forcing air and steam through the producer and delivering the resultant gas under pressure to the point required. This is called a pressure plant.

It becomes the first duty of the engineer laying out a power plant with gas engines as prime movers to ask himself the following questions:—

1. Shall the plant be of the suction, suction pressure, or pressure type?

2. How is it possible to obtain the maximum benefit from the use of producer gas in Canada where, during six months of the year, heating in a factory is required?

Now, one of the great advantages that producer gas offers over steam or any other source of power is its applicability to singeing, grazing, melting, etc., and it is this side of the problem which has been neglected in this country, and has held back its rapid development. Also, every factory owner is obsessed with the idea that with a gas engine it is impossible to utilize the exhaust for heating purposes as in a steam engine, and many are the orders for gas plants that have been lost in this way, owing to the gas engineer being nonplussed when asked if he could undertake to heat the factory in the winter from the exhaust.

The day when this remark regarding factory heating held good is over, and I am in a position to say that anyone utilizing 50 horse-power and over on a reasonably steady load can by the use of a properly designed heater obtain during the day nearly as much heating effect from a gas plant as from a steam system, the difference being purely in the efficiency of the gas engine and the steam engine and the amount of heat wasted in the two systems, which, of course, is less in the gas engine than the steam engine.

Some rough rules to guide the engineer in settling on the type of plant to be employed are as follows:—

1. For a straight power proposition, such as the driving of a factory, I would recommend a plain suction plant.

2. Where there is the chance of applying gas to brazing, etc., a suction pressure plant.

3. Where several engines are running at different points on a violently fluctuating level, a pressure plant.

I propose now to mention some of the troubles that are met with in actual practice, troubles which have their origin in causes ridiculously simple, and yet cause the engineer many moments of worry until he knows the vagaries of producer gas as thoroughly as the steam engineer knows those of steam. I shall take the instance of a plain suction plant running an engine on a steady load. That is the simplest problem you can have, the engine being a single cylinder hit-and-miss Otto cycle engine.

Starting from the time the man blows up his fire, he is supposed to have good gas and his engine under way in two minutes. Suppose he cannot get any gas, and the time for starting the factory arrives, he asks himself what is the matter, and generally loses his head, blaming the producer, the state of irritation being increased by the monotonous job of grinding the fan. What he should do is this:—

1. See that water is in his boiler. If there is not any, he is making air gas only, and the addition of steam will cure the trouble.

2. Feel at his test-cock if there is plenty of pressure, and look at his gauge, an instrument which is hardly ever installed, and yet tells such a lot to an intelligent operator. If there is no pressure at the cock and his fan runs easily, and yet the gauge registers two or three inches, he will know that the gauge which covers the test-cock is blocked, and that by renewing it he will probably find good gas, and plenty of it. This simple mistake has nonplussed many good men at times.

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