DESIGN AND DEVELOPMENT OF LOW-PRESSURE ATOMIZER NOZZLE

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Abstract: This research article consists of the development framework of two HFO fired burners. One of the burners works in the "high pressure atomizing air" and another in the low pressure. In this article technical specifications on how the automated nozzle works significantly has been discussed. The calculations and hypothesis is denoted here in this study with experimental validations. The research article has gone with the work procedure of spray nozzles, atomization quality in terms of numerical simulation**.**

Index Terms **- Spray nozzle, atomizer nozzle, HFO, HP solution**

I. INTRODUCTION

MSME steel sector, located in India is looking for cost-efficient performance and ***Heavy fuel Oil (HFO)*** burners. The objective of this research article is to point to a reliable cost-efficient strategy addressing the function of atomizer nozzles. The functioning can be relevant and useful in the Indian market, protective advantage. Here in this article, the functioning of the Atomizer nozzle has illustrated signifying the technology. The aim of this study to increase the use of HFO fired burners reducing the cost. The discussion engaged to find out the efficacy and efficiency of atomizer nozzles through a suitable methodology.

II. IMPORTANCE OF ATOMIZER NOZZLES REGARDING DROPLET SIZE

Oil burner is a combustion machine that focuses on promoting the combustion of oil fuel [1]. The fundamental functioning process of all types of fuel burner is almost similar where the combustion process can be thought of accordingly- the fuel oil should be vaporized because before combusting all matters should be transformed to gas or vapor [4]. The vapor should be mixed with the air to acquire the necessary oxygen for the combustion procedures. In India, the MSME Steel industry needs cost-effective, efficient and strong fuel oil fuel Brenner. Moreover, there are many companies was projected to have over 150 Cores INR in 2015. Similarly, Private Bloom Combustion (India) Ltd. has operated in India since 2007 with salespeople in India. They meet all quality standards in their production plant and guarantee that their Indian clients expect a lower good quality, which have been followed worldwide by production lines from Bloom. Founded in 1934 in Pittsburgh, USA, the Bloom Manufacturing Company became a specialist combustion technology industry leader. It works world-wide and serves the major industrialised countries of Europe, China, Russia, Brazil and India. However, the Relational burner technology industry, as this company's leaders in steel & aluminium factories and sell over 750 pairs across the world.

The major function of a nozzle is to modify the oil particles into the smallest droplet to help in burning. Droplet size is important for nozzle characterization and the air pressure control. Weighted volume indicates that the diameter is proportional to nozzle diameter, and it is inversely proportional when it comes to the air pressure.

III. IMPORTANCE OF ATOMIZER NOZZLES REGARDING FUEL

Another functioning component of an atomizer nozzle is fuel. Usually, on the high-pressure burner, a fixed pressure remains in the nozzle [2]. The manufacturers usually use the fixed pressure when they make the burners. Based upon the making pattern of the burner the fuel consumption remains fixed at the same stage, usually it remains 100 psi []. With the predetermined pressure, the nozzle should be dimensioned and manufactured. The making process is also implicative concerning the expenditure of limite4d amount of fuel expenditure. Henceforth, the functional dimension should be controlled minutely. The flow rate of the fuel and functioning process should be blended to make it beneficial to increase the usage. Different flow rates and spray angles are taw string to scale the machining of it.

IV. PROPOSED METHOD

Geometry definition, operating condition is applied to understand the design of the HFO atomization. Manufacturing design is depicted in imagery explanation. Testing of oil injectors applying surrogate fluid has been put for the analysis of atomized burner.

V. DISCUSSION AND ANALYSIS

Functioning process of nozzles

The separation of the fuel oil into droplet parts needs energy application [2]. In the nozzle functioning, the energy surpasses through pressure usually derived from the motor pump. Pressure energy is converted into velocity energy to break the droplets when fuel is supplied.

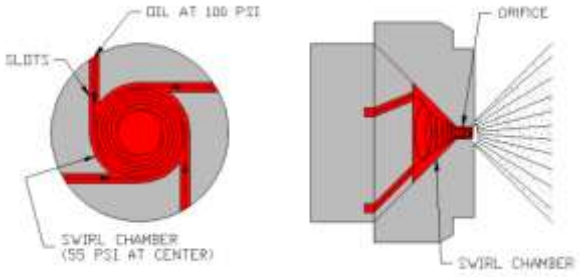

Figure 1: Functioning of the pressure-atomizing nozzle

(Source: Inspired by [3])

The oil extends on the orifice by rapidly rotating oil tube and a centrifugal force is developed to create pressure. The total pressure which is supplied is not modified into velocity as some of it remains as energy pressure. Significant engineering is done at their Pittsburgh USA-based Global Engineering Centre. With their CFD modelling skills, they can pre-analyze restoration and fuel cell projects in Pittsburgh so that the customer may attain maximum results without compromises. A combustion device is an oil burner. It is aimed at encouraging effective option fuel consumption. There are various kinds of oil burners technically, such as vaporizers, the kind of low temperature gun, type of high-pressure firearms and different forms of rotational firearms. However, all these various combustion plants are built on the same core mechanisms.

Conditions that affect the nozzle performance

For liquid crystallisation, the other depends on the low temperature solution (LP). This technique can considerably lower the plant operating costs (OPEX), as high pressures are no longer necessary for the crushing and using a compression with a related enhanced power usage and expense. Various factors affect the nozzle performance like surface tension, velocity or viscosity [6]. Surface tension stabilizes the liquid and prevents the segmentation of the droplets. It tends to sort on the smallest area [3]. The effect is almost similar to the elastic membrane of our skin spreading the liquid throughout the whole body and creating pressure. Viscosity has a similar effect as the surface tension; it resists the agitation of the fluid, prevents the breakup of droplets, and leads towards a larger average of the droplet size. Dentistry helps to resist acceleration. Besides these, the temperature and boiling pressure has also a great effect on the function of nozzles [5]. The relation of temperature and viscosity is effective. In low temperatures, the viscosity of the fuel remains very high. High boiling scale causes a longer fire which is at 700 degrees at the endpoint. The function of the fuel droplet properly is also important. In the higher discharge rate, the size remains usually larger and velocity temperature or surface tension leads to the modification of droplets. One uses high pressure air to fragment/atomize the liquid HFO as it is called HP solution. This method is quite popular and classical since air is generally used to feed the dematerializing device at about 6 pressures to 7 bar. The actual air pressure atomizing at the piston intake is usually between 1 bar and 3 bar, based on the piston type. The vaporising pot type is really the simplest sort of burner. Heat is supplied to an oil pudder in this sort of burner, forcing the vapours to be released from the feed contact. After combining with the correct volume of electricity, these vapours are subsequently burnt. The vaporisation process is enhanced by physical mixing to expedite this burning process. This is done by splitting the oil into numerous very tiny droplets. In addition, these types of heating proceeds are very short period whenever extreme temps are introduced, a very little droplet can be vaporised. Through the conduction process, a GPH 1.00 dozen, with fuel oil No. 2 spraying, pushes the gasoline up into drops, which are approx. 002 inch in average diameter (50 microns). This indicates that one gallon of gasoline is split into around 55,000,000,000 goutlets, from 20002" to 10." This raises the temperature by around 3800 times as there's really around 690,000 cubic ft in a gallon of petrol. Dividing oil into little droplets needs energy delivery as this energy comes from a properly constructed motor-powered pump, generally in the form of a suction for the dust. Pressure heat as such does not break up the oil that first has to be transformed to speed energy. The gasoline is provided underneath the tension, normally 100 psi, and forced into a system of troughs or slots. The oil comes at very high speed from these holes. Surface tension is the trend towards the lowest region of the water phase. The result is like a standardized interface or skin enveloping the body and shaping it into the thickness that is the least. Interfacial tension resists any effort to remove or modify the form of the liquids. Surface stress also pins off the particles at the front of the fluid layer as it expands and forms the spray. The impact of surface voltage fluctuations may typically have been within the region of boiling point seen in fuel oils.

The TTA type spray tubs, in contrast, are air aided spray tubs. However, these Bloom nozzles have recurring stability problems as its highly pressurized sensitivity has been reported. The operational conditions as flow and pressure also can be highly volatile and fluctuations in one of the two-fluid feeder lines often destabilise the other line and change all flow rates and tension, as this deep connection might lead to a completely dysfunctional water flow.

VI. Conclusion

The atomized nozzle design is influenced by different parameters like HFO tube, Diameter of air hole the air tube, and the spray hole. Surface Tension, temperature, or velocity all influence fuel patterns. By modifying the conventional manufacturing method of nozzles observing these variables, the cost of fuel can be reduced. It will help to maximize the popularity in the market.

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