Diesel Filter for Small Scale Industry

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Abstract

In small scale industries garages workshops the diesel is used to clean the mechanical parts. The diesel gets contaminated with lubricating oil, grease, carbon particles, dust and becomes of no use, so it is wasted as the filtration process is costly and is not affordable for every small garages owner resulting recycling of very small amount of waste diesel oil mixture. It is necessary to recycle this waste mixture to reuse instead of flushing as Diesel is no renewable source of energy. The filtration units are available but it is not profitable for everyone. Huge amount of diesel get wasted in thousands of small scale industries because of expensive filtration methods. Nature is also facing many environmental issues on account of this waste. To overcome this issue it is necessary to develop a low cost filtration unit for each and every industry. To develop a separate low cost filtration unit for each industry which industry is capable to recycle their waste mixture is the objective of proposed work.

Keywords: Reduce, Reuse, Recycle, Filter, Waste Management

I. INTRODUCTION

The most obvious evolutionary trends in filtration technology today is the capability to remove finer and finer particles from process fluid stream. The rise of nanotechnology has created a need for removing particles of 100 nanometers or even smaller and the filtration industry has responded with solution capable of capture down to the ionic and atomic levels.

The main aim of our filter is to reduce the cost of filtration process and reduce the waste. We are developing a small filtration unit which will be compact in size, easy to operate and with lowest possible cost. This filtration unit can be fitted in any industry where wastage of diesel occurs.

In many garages workshops the diesel is used to wash the parts in this the diesel is wasted.as the diesel is non-conventional source of energy and it is tending towards the end of stocks of petroleum liquids from the work.it is also found that diesel is the only liquid which can be used to clean the mechanical parts, so it is necessary to develop filter to recycle the diesel. The cost of the diesel is also increasing so it will help to reduce the capital cost invested in the price of diesel.

II. MATHEMATICAL FORMULAE

A. *Filtration Theory*

1) Poiseulle's law:

$$\frac{1}{A}\frac{dV}{dt} = \frac{\Delta P}{\mu(R_m + R_c)}$$

2) Cake resistance

$$R_m = \frac{\alpha W}{A}$$

3) Specific cake resistance

$$\alpha = \alpha' \Delta P^s$$

Where, V=filtration volume, A=filter area=time, ΔP=pressure driving force, μ=both viscosity=mass of filter cake=resistance, α=specific cake resistances=compressibility factor

The filter resistance is much less than the cake resistance

$$\frac{1}{A}\frac{dV}{dt} = \frac{\Delta P}{\mu(\alpha' \Delta P^s \frac{W}{A})}$$

When the filter cake is incompressible, S=0

$$\frac{1}{A}\frac{dV}{dt} = \frac{\Delta P}{\mu(\alpha' \frac{W}{A})}$$

When the filter cake is very compressible, S=1.0

$$\frac{1}{A}\frac{dV}{dt} = \frac{1}{\mu(\alpha' \frac{W}{A})}$$

Flocculation of cells
Sedimentation Rate

$$V_s = \frac{{d_p}^2 (p_p - p_s)}{18\mu} g_c$$

Filtration Rate

$$\frac{dV}{dt} = \frac{k\Delta P}{V{S_0}^2}$$

$S_0 = k'(1/D_p)^2$
${S_0}^2 = k''/{D_p}^4$

$$\frac{dV}{dt} = \frac{k_0 \Delta P {D_p}^4}{V}$$

III. CONCLUSION

Filtration and separation are affected by many variables. For example, in terms of the particles, the amount of solids, size, shape, particle density, compressibility of the solids, zeta potential and other ionic forces, agglomeration of the particles due to internal bonding and forces, etc. all impact the filtration flux rate. Two particles of the same size, may behave differently if one is flat in shape while the other is irregularly shaped.

In terms of the liquid, there are also characteristics that impact the filtration rates such as temperature, viscosity, density, pH, components of the liquid, chemical additions (flocculants, coagulants, etc.), polar/non-polar constituents, the interaction of the solids and liquids, etc. Once again, a small change in the liquid can have a dramatic impact on the rates.

As can be seen, many variables must be examined during filtration studies. This article discussed techniques to conduct laboratory tests and then how these results can be transferred to production systems. The process engineer through the development of an optimum test plan can analyse the resultant cakes and slurries to maximize his or her process. In the future, if the actual results differ from the tested results, then, with a good baseline of tests, the engineer can analyse the differences and develop the necessary corrective actions for a successful result and process.

ACKNOWLEDGEMENT

The present work is under the guidance of Mrs. Seema Pravin Mane, Assistant Professor, and Mechanical Engineering Department of P.V.P.I.T. Budhgaon. We express our sincere thanks to Mr. Pravin A. Mane, Assistant Professor, Mechanical Engineering Department, WCE, Sangli. For helping us in this present work

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