

Powder Transfer Through Vacuum

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Abstract : This study has been undertaken to analyze the capacity of Vacuum pump with respect to transfer rate of materials of different density & transfer height.

INTRODUCTION

Pharmaceutical manufacturing units, food processing industry & in API units product transfer from one process to another becoming important in terms of complying GMP & productivity.

Close transfer ensures not only GMP but it also reduces transfer time & manpower. It's being a dust free operation minimizes chances of contamination & health hazards of people involved in the process.

Manufacturing of potent drugs like harmon, cancer etc implementation of close transfer is fundamental requirements of regulatory bodies like UK MHRA, USFDA etc.

NEED OF THE STUDY.

To establish required transfer rate at particular height of feeding equipment the study is carried out.

In general powder particles are defined in terms of PSD & density. Flow ability differs based on density of powder, hence pump capacity would differ from product to product.

So a simplified equation is carried out to decide capacity of Vacuum pump with respect to product characteristics & transfer height.

I fervently believe it will help to project & engineering personnel.

3.1 Equation for transfer rate :

Vacuum pumps are selected based on two aspects a) Flow rate b) Pump head.

Flow rate is defined as cu.m/hr & density of powder is kg/ cu.m

Multiplying both flow rate & density would give kg/hr.

Let us consider this as equation 1.

On an average density of product is 1000 times more than that of air. Hence to get actual flow rate of Vacuum Pump, divide equation 1 by 100 considering factor of safety 10 for friction & other losses.

So final equation of product transfer: flow rate of Vacuum Pump (cu.m/hr) \times density of powder (kg/cu.m) \div 100 = transfer rate (kg/hr)

3.2 Transfer height

Transfer height is based on available pump head. In general for any vacuum pump head is limited to 10.3 m

As vacuum pressure can't be more than atmospheric pressure.

So if particles have density within 1gm/cc, then transfer height would be 10 m approx.

3.3 Theoretical framework

Variables with theory based on extensive study of different types of pumps & blowers & their limitations.

3.4 RESEARCH METHODOLOGY

In methodology we have carried out several in house trials & also studied the cases where transfer height is more than 10 m.

In such cases we recommend high pressure root blower where velocity pressure takes away extra height

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