

Review paper on Filtration methods and recent trends

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Abstract: An optimization study was carried out to compare different filter cleaning processes and to evaluate better one. Filtration is key unit process in water treatment, textile industries, sugar industries, food industries chemical industries etc. This process is of normal cycle i.e. filtration followed by backwashing. Backwash is up flow cycle for cleaning of clogged media, water is used to remove deposits from the filter bed. The water should return the media quickly to its original perfectly clean state for the next cycle. The significance of these data are discussed in the context of the potential economic cleaning of the filter bed and candles to use it again in its original state.

Keywords – candle, chemical cleaning, filtration, Tech-clean system, ultrasonic cleaning

I. INTRODUCTION

Candle filter is a vital unit process in the filtration process. It captures and removes coagulated and flocculated matter and other suspended matter not removed during the earlier treatment processes. The pores in the filter bed slowly become clogged with each filter run and the media progressively collects deposit through the continuous use. During normal operations cleaning is initiated by excessive head loss, deterioration in filtrate quality or when the predetermined time for a filter run has elapsed. Candle Filters are very well suited for handling flammable, toxic and corrosive materials since they are designed for hazardous environments when high pressure and safe operation are required. Likewise, they may be readily jacketed for applications whenever hot or cold temperatures are to be preserved. Candle Filters are available in all sizes and the larger types may have an area of 200 m² and contain 250 or more filtering elements installed in 2.5 to 3.0 meter diameter vessels. The operating pressure range is quite wide but most of the Candle Filters operate at a pressure of 6 bars. The objective of our work is to study of fluidization process through practical observations so as to provide a process model on which optimization of the process can be made.

II. Need Of Cleaning Candles

The need for large scale and heavy-duty washing and cleaning has existed since the industrial revolution or even before. There are several different approaches to these more traditional cleaning processes but they can be grouped in terms of the ones used in each of the various types of manufacturing industries.

- As the filters are used in various industries to clean or filter various fluids of various densities this tends to clog the filter membrane.
- As the filter membrane gets clogged system pressure increases.
- Internal stresses are generated due to increase in pressure
- Quality of filtration gets decreased.
- It may lead to system failure and leakages.

Hence to avoid all above problems, cleaning of candle filter is essential to increase the life of filter. Some of the filter processes are explained below.

III. VARIOUS CANDLE CLEANING PROCESS

- **Simple water cleaning:**-Candles from filters are removed after predominant time period for cleaning, primary process for cleaning of candle is to wash with water followed by scrubbing with brushes. Then further process of cleaning depends upon filter material of membrane, media, size of candle, cost encored on cleaning and efficiency of filtration process to be used.
- **Chemical cleaning:** - Chemical cleaning is the processes used to clean the clogged filter which are used in industries. Acid bath or salt bath are used to clean the candles to increase their life. Acid such as hydrochloric acid (HCl), sulphuric acid (H₂SO₄) are used in various concentrations with a diluting media it also depends upon size of candle filter. As filter membranes are made of various low strength materials, so chemical cleaning has limitations.

- **Ultrasonic cleaning:** - In ultrasonic cleaning the candle which is to be cleaned is placed in the water tub. An ultrasonic system creates ultrasonic sound waves which creates bubbles in water, these bubbles travels along the candle membrane by removing the clogged dirt, and hence cleaning is obtained. Frequency of sound waves depends upon candle to be cleaned, size, and other various factors. Ultrasound is particularly effective for cleaning because it is capable of dislodging and removing surface contamination in the form of inorganic dirt or microbiological material through the shock waves and jet formation that accompany acoustic cavitation bubble collapse. This type of cleaning can be used for both small and large items and can penetrate deep into crevices and cavities in the surface of an object.
- **Pressurized air cleaning:** - Compressed air is used to clean the membrane of candle, high pressurized jet of air is forced on to candle membrane. This causes to removal of contaminants or dirt accumulated on the membrane.

IV. RECENT TRENDS

Different methods have been now immersing in filtration area according to new requirements of various industries. Tech-clean candle filter is a machine used to clean the candle filters used in industrial cleaning process

Construction Of Tech-Clean Candle Filter

Parts used in system-

- 1 bearing 3304 (water proof) 2 nos
- 2- lock nut m18, m22, m20 pitch std
- 3- pulley 22-8M-20 6f type -2 nos and 44-8M-20 6f type - 2 nos (make optibelt)
- and belt for it 20 width(c.d.-216.5 mm)and(c.d.412.5 mm)
- 4- bearing 3306 (water proof)
- 5- internal circlip for bore 72 mm -2 nos, for bore 52 mm - 2 nos
- 6- flange mounting bearing 20 mm id (UCFL204 D1-20)(waterproof) 2 nos
- 7- ball nut SSVW2510-5.0P and screw length 1635 mm(with machining)(make super slide)
- 8- linear bush with housing LMA-20 UU -2 NOS make super slide
- 9- guide rod DIA 20 x 1680 mm L 2 NOS make super slide

Working Principal

Tech-clean system is a compact, environmental and user friendly candle cleaning equipment. Filtration process i.e. polymer filtration takes place from outside of candle to inside. Normally sintered fibered filtration is a depth filtration. It is coarser to finer. By particles are stacked to surfaces and small acnes inside the filtration media which makes it too difficult to clean during filtration process, the contaminants are trapped inside and on the surface of filtration media of removable mesh pack candle. After prolonged filtration the filter pressure increases and efficiency of filtration and candle starts to drop down.

First filter is removed and then pre cleaning is done by solvent or by polymer .the process is followed by chemical cleaning/ultrasonic cleaning. Post cleaning is carried out by tech clean to remove maximum contamination stuck in the filtration media and on the surface media Tech clean system works on the back flush mechanism. Flow of polymer is normally coarse to fine the filtration is out to in wash and back wash is from in to out.

The cleaning is effective by two methods high pressure water jet spray nozzle which operates in high pressure up down direction Centrifugal force- high speed rotation creates centrifugal force to push the particles further outside rotation high and pushing of high pressure jet cleans the candles uniformly cross the length and diameter. spray nozzle which operates at high pressure 60 bar in up down direction in mesh pack in RPM candle .High speed rotation low to 500 rpm creates a centrifugal force to push the particles outside this cleans the candle to maximum level.



Fig. Tech-clean candle filter system

V. CONCLUSION

As various types of candle cleaning process such as Ultrasonic cleaning, Air Jet cleaning, Chemical cleaning, Water cleaning etc. been studied during the research. The process, discussed in current paper, is flexible and versatile in nature which can clean various types of Candles. Tech clean is particularly effective for cleaning because it is capable of dislodging and removing surface contamination in the form of inorganic dirt or microbiological material through the water jet and centrifugal force. Increased cleaning speed which can often be applied to assembled components without the need to break them down into individual units.

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