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Design of Sinus Flow Filters

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TIMEX-FTS Filtration Treatment Systems

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Abstract: Based on the service reports received from agricultural irrigation companies are analysed, 2 major problems in this field stand out. First one is the damage caused by the insoluble organic and inorganic particles in the water supplied from the water source to the irrigation pipeline and the control equipment on it, and as a result, the irrigation efficiency decreases. The second problem is that the filters with different filtration degrees used to solve the first problem cause to consume a lot of energy during operation and increase the operation & maintenance costs and narrow the usage area. Separate products in different filtration degrees offered for the first problem caused the second problem, so another alternative way had to be found for a permanent solution. For this purpose, our company has designed and manufactured SinusFlow filters which is a compact product with a double stage with single motor that combines different filtration degrees in a single product with a quick manufacturing center. As a result of development of this new product, 2 different (coarse & fine) type of filters combine in a single filter. In this way, while the filtering process is carried out with a single motor with much less energy consumption, the usage area and operation & maintenance costs have been reduced.

Keywords: Filtration, Water, Agricultural irrigation

Introduction

Industrial filters are used in the field of agricultural irrigation, especially in the recent years. In order to increase the filtration efficiency in these areas and to maximize the usage area, the designs of the filters are still being developed. TIMEX is a company that has been designing and manufacturing industrial filters for agricultural irrigation since 30 years. When the technical service reports from all customers in this field are evaluated, 1 major problem stands out. This problem is that the filtration efficiency decreases as a result of the clogging of single strainer filters in a very short time due to the insoluble particles of very different particle size in the source waters used in these areas and these filters require very frequent maintenance. In order to solve this problem, our company has been designed as separate products with coarse and fine strainers for agricultural irrigation areas and integrated into the irrigation systems.

However, this situation both limited the usage area in the field and caused an excessive increase in energy consumption and expenses in the field. Upon this, our company started R&D studies and decided to realise the idea of combining 2 strainers with different microns in a single pressure vessel. Upon this, firstly, tests were conducted in laboratories with the samples taken from the fields (Landa et al., 1997). It was decided which filtration degrees were required for which sites. Then design works started. After the design calculations were completed, the production process was started and the first products were produced.

Method

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- Selection and peer-review under responsibility of the Organizing Committee of the Conference

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The design of the related product was made according to ASME Sec VIII Div. 1 standard. The solid model has been created using Autodesk Inventor software. Solid model photos are available below (Figure 1, Figure 2, Figure 3, Figure 4).

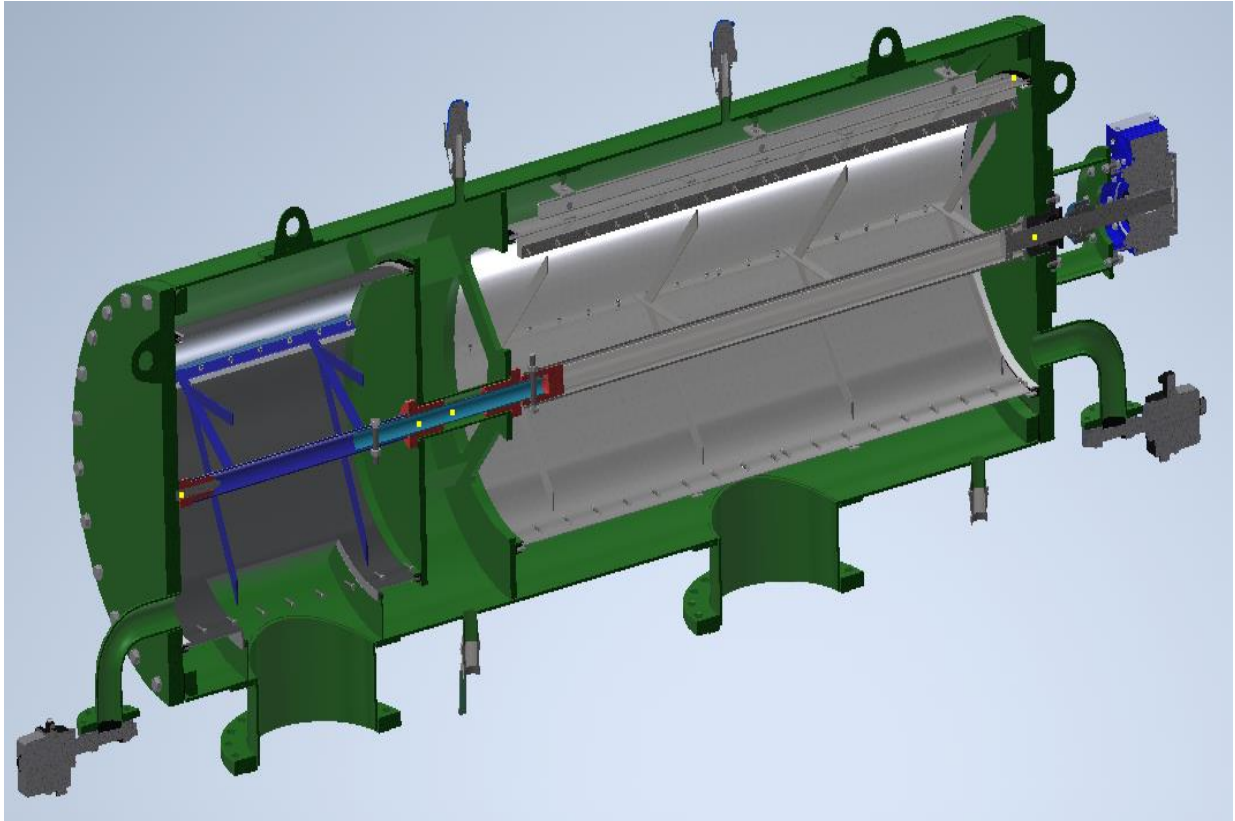


Figure 1. Section view of the sinus flow filter

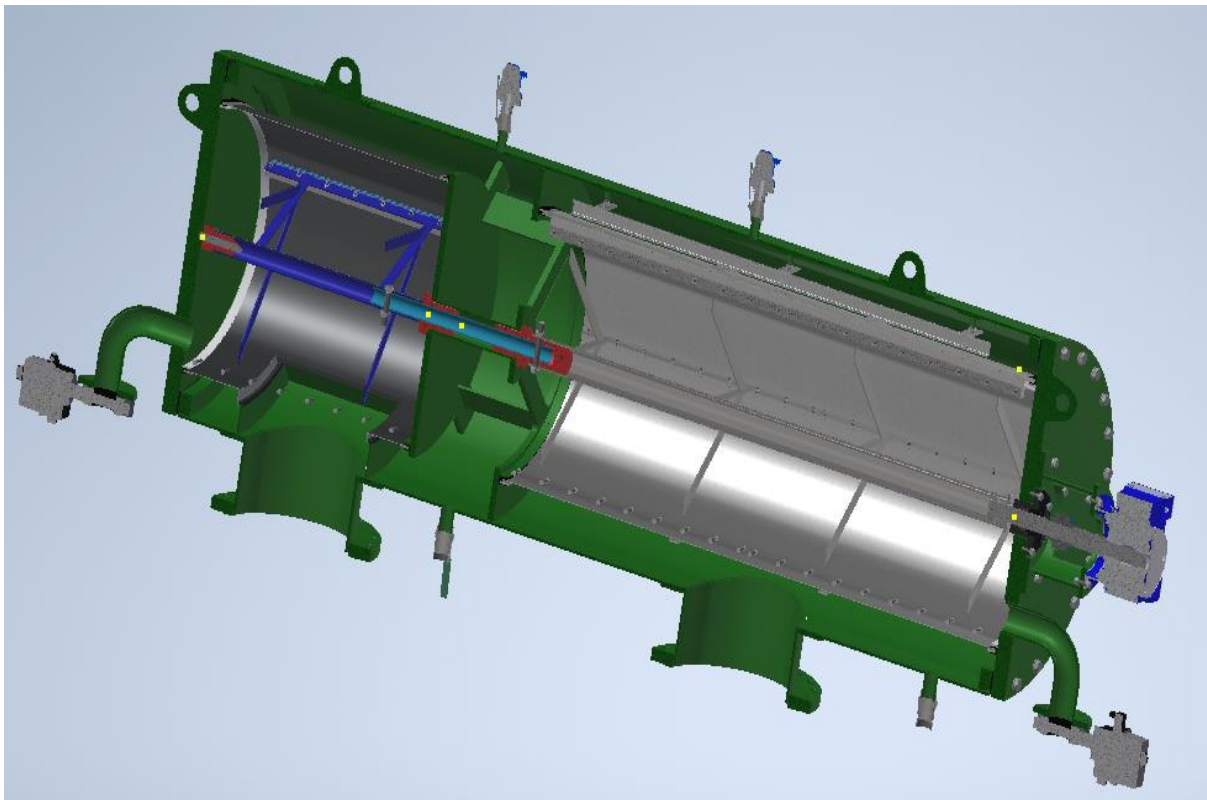


Figure 2. Section view of the sinus flow filter

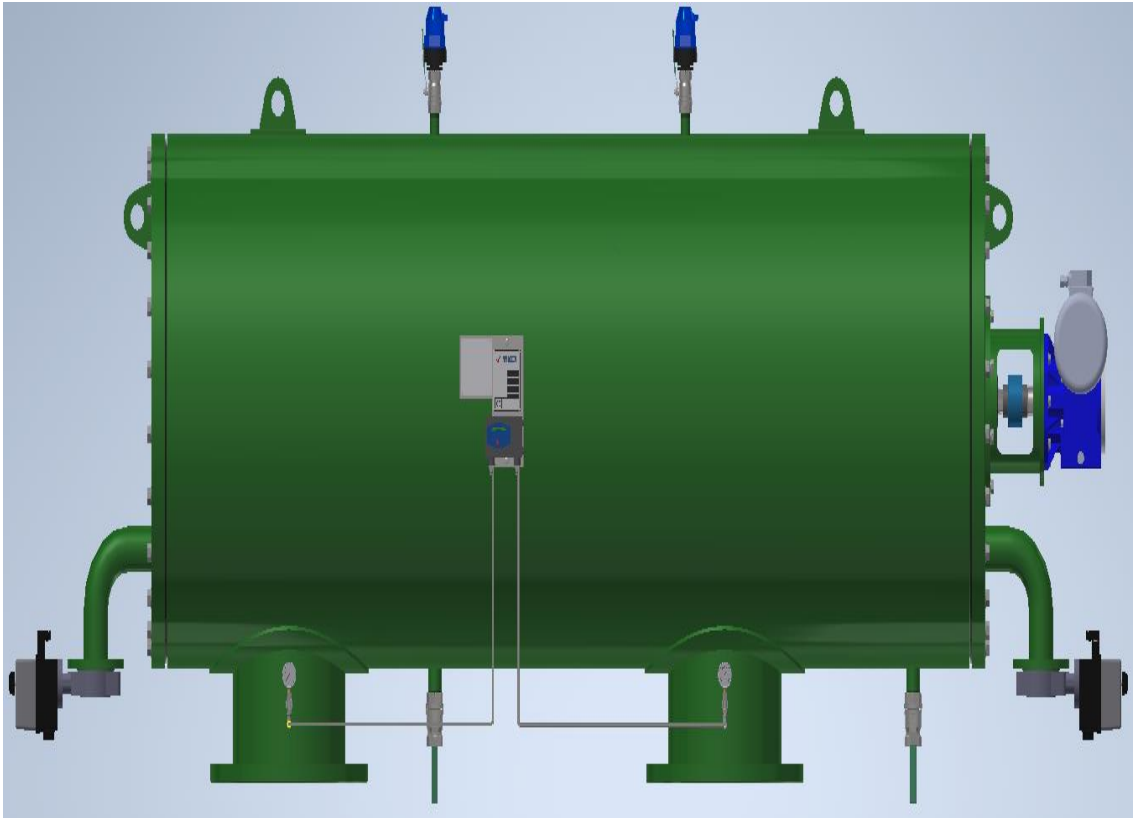


Figure 3. 3D Model of the sinus flow filter

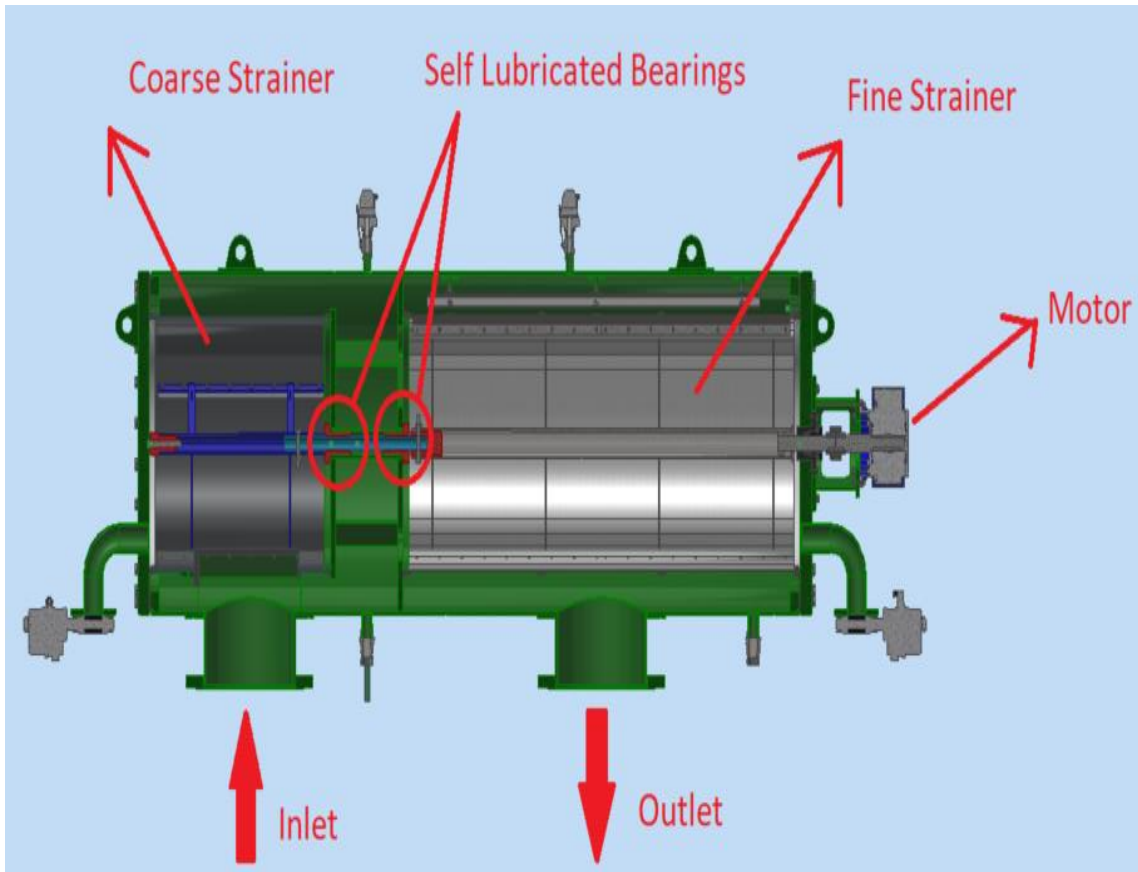


Figure 4. Section view of the sinus flow filter

As can be seen in the drawings above, a total of 2 strainers, coarse and fine, are placed in parallel in the pressure vessel. Since the sealing of fine strainer is very important, the centering of the strainer must be precise. In order to achieve this, it was decided to use rail mechanism and the centering was done in the most accurate way with this system. Another consideration while designing is to increase the velocity of the water by narrowing the area in the transition from coarse filter to fine filter, so that the particles adhere more homogeneously to the inner surface of the screen and the inner surface area is used more efficiently. Thus, it is aimed to increase filtration efficiency. In order to provide sinus flow (Kehrein, 2001), plates between two sieves were used. Other purpose of this plate is firstly to provide space for the sealing equipments to fix and to ensure the centering of the shaft.

It is aimed to maximise energy saving with this new design by a single motor instead of 2 motors. In addition to the transition from a 2-motor system to a single motor, the fact that the two-way motor movement is reduced to a single direction with the collector design made in such a way that the nozzles do not need to move horizontally is also considered for energy saving. Another expected benefit of the design of Sinus Flow filters is the compact design, which increases the usage area of the field.

Results and Discussion

The completed products were integrated into agricultural irrigation areas. (Figure 5, Figure 6, Figure 7). According to the user reports sent to us, the major results can be summarized as follows. Firstly, energy consumption in the field has decreased by 30% through this new design with a single motor. Secondly, the maintenance period of the filters is delayed with the Sinus Flow and therefore the maintenance periods are prolonged. Lastly, the usage area has increased greatly with these compact filters installed instead of many industrial filters of different micron grades used in the old systems to do the same job.



Figure 5. Sinus flow filters from agricultural field



Figure 6. Sinus flow filters from agricultural field



Figure 7. Sinus flow filters from agricultural field

Conclusion

In this article, the design of a new product for the solution of user problems based on reports from agricultural irrigation areas is discussed. To conclude, the new designed Sinus Flow filters have achieved the purpose and user problems received from the site have been solved.

Scientific Ethics Declaration

The authors declare that the scientific ethical and legal responsibility of this article published in EPSTEM journal belongs to the authors.

Acknowledgements or Notes

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