

DESIGN AND DEVELOPMENT OF DOUBLE AUTO SHUTOFF VALVE INSTALLED IN SCRAPER BOARD IN DISC FILTER

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ABSTRACT

Auto shut off valve with double piping inlet is to be installed in disc type industrial filter, Filter is used for lime mud /pulping filtration, supply shut off is to be made with acting along auto scraper board mechanism which is installed for mud remover on multiple disc. Mechanism is to be done within limited parameters so that work and application can be effective on site. Whole project work is designed with simple and light weight mechanical links which will be proved with analysis result to carry out its behaviour under running conditions. Valve is effectively design to stop supply to the two pipes which are 3 inch in diameter. Valve will take inlet flow of ~150 LPM from each inlet. The mechanism of auto shut off valve is made for special purpose customised operation. All the linkages used are designed with proper mechanical calculations and forces study to sustain incoming pressure with its boundary conditions considerations. Main design of leak proof piston is took effort to work this valve effectively attached with collinear straight line bar mechanism with working on pneumatic double acting cylinder. Validation of valve, piston and mechanism under it will be carried out with structural analysis all the stress and deflection study is to be done to prove its capability and feasibility in the machine.

INTRODUCTION

A Straight line mechanism is simplest movable closed chain, it's consists of linkage which are connected in a loop by joint. These joints are configured so the links move in parallel planes.

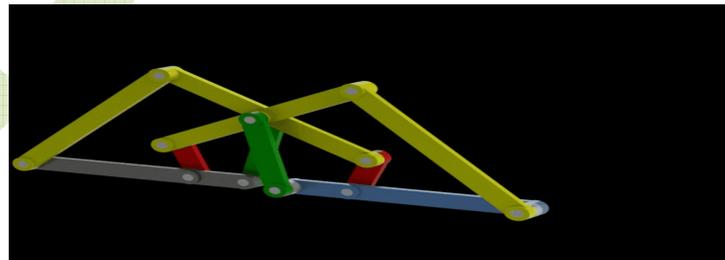


Fig1: collinear straight line bar Mechanism

In this Auto shut off valve one or other type of mechanism .the suitable mechanism is synthesized using graphical method. In this paper attempt has been made to achieve the pulp feed in filter. The linkages are provided to gives the required motion at the output. The Eight links are used to complete the mechanism out of eight links two are placed perfectly horizontal and out of that two link's one move linear and other one is fixed. The remaining linkages are moving vertically, that up and down stream motion. The piston rod and piston assembly have mounted on those remaining linkages. Due to vertical motion of linkages, the piston move up and down. When the horizontal linkages moves linearly forward direction then linkages move downward direction and that time valve are open .also when the horizontal linkages moves linearly backward direction then linkages move upward direction and that time valve are closed.

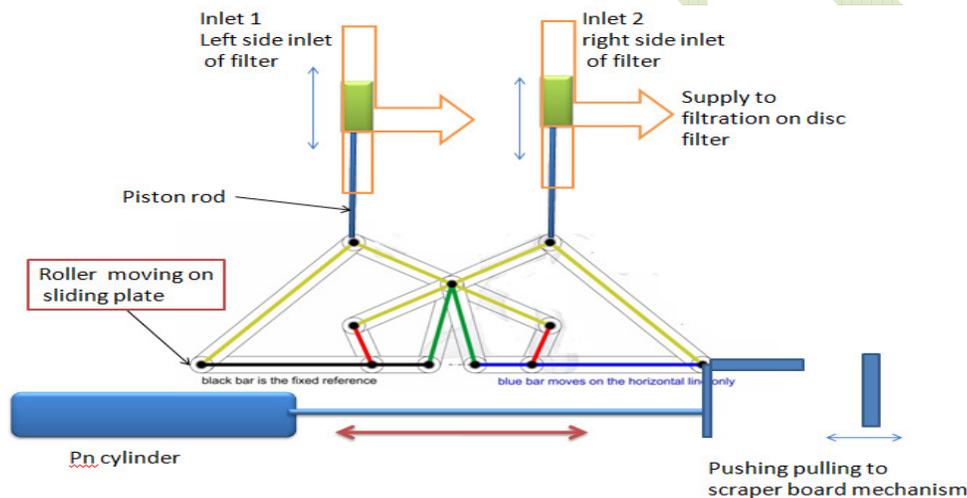


Fig 2: Concept level product and instrumentation drawing

Straight line bar mechanism is installed to make feasible linkage with valve working and scraper board working to activate them simultaneously, Basic requirement of this design is to make active this valve to stop flow coming to the filtration while scraper board is removing slurry and lime mud from filtration disc which are already in filter, so we can called this product as auto shut of valve. It stops flow coming directly to the filtration medium from inlet.

CONCEPT DESIGN AND DEVELOPMENT

Input

Flow from each inlet	: >150 LPM,
Material to be used	: AISI316,
Scraper board need stroke to activate	: 60mm,
Linear Stroke	: more than 200 mm,
Top stroke to opening and closing the valve	: more than 110 mm needed,
We can use above input for Design.	

Initial conceptual dimensioning

Figure shows that initial dimension for opening and closing position for valve.

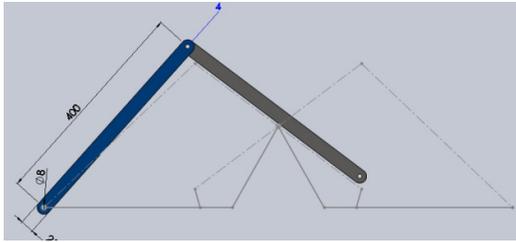


Fig3: Initial Conceptual Dimensioning

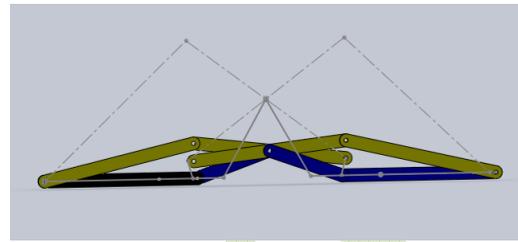


Fig4: Initial Downward Stork

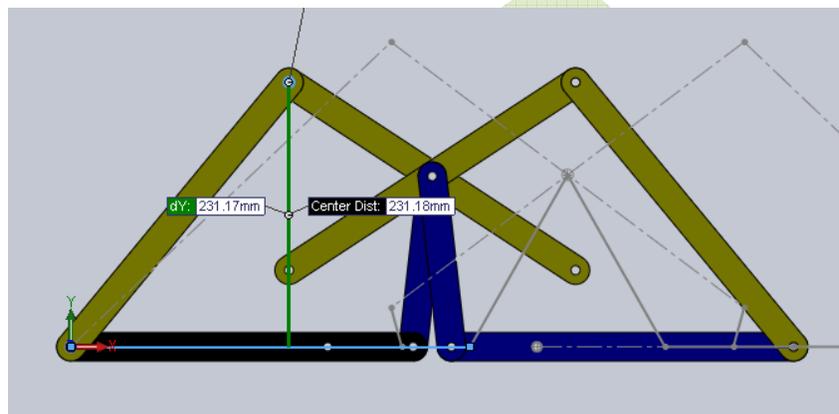


Fig5: Initial Upward Stork

The up vertical stroke is 135 mm and linear horizontal component movement are 880 mm.

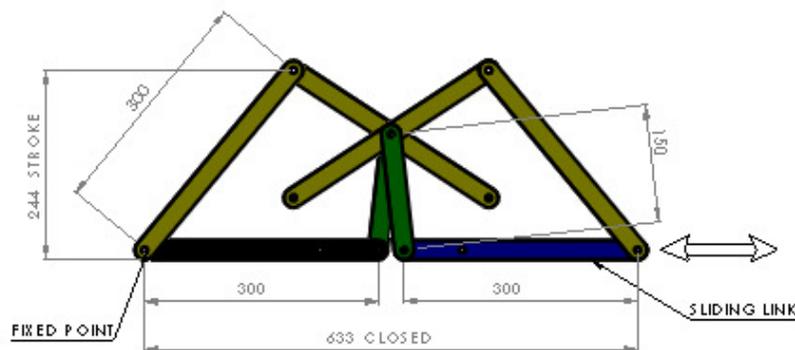


Fig6: All Linkages with Dimension

Wheel mounting at bottom of link assembly

Below figure shows the bottom wheel assembly. Which are connected to linkages and it moves on slider.

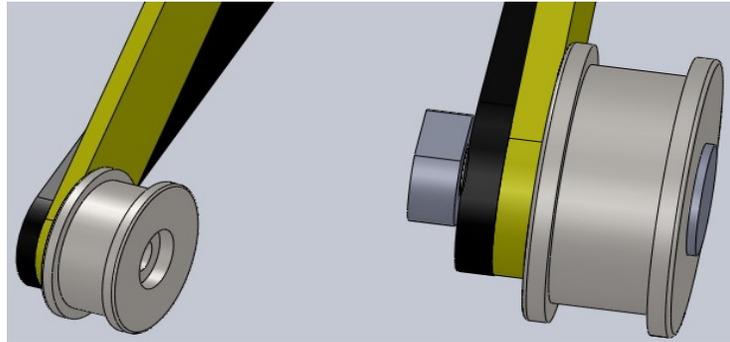


Fig7: Bottom Well Linkage Assembly

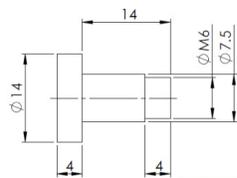


Fig8: Lock pin for wheels

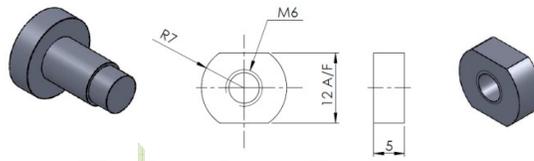


Fig9: Lock Nut

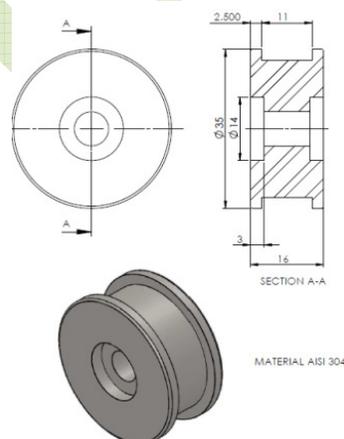


Fig10: Wheels

Closed position importance

645 mm total length as shown in link assembly diameter and 240 mm top stroke height,

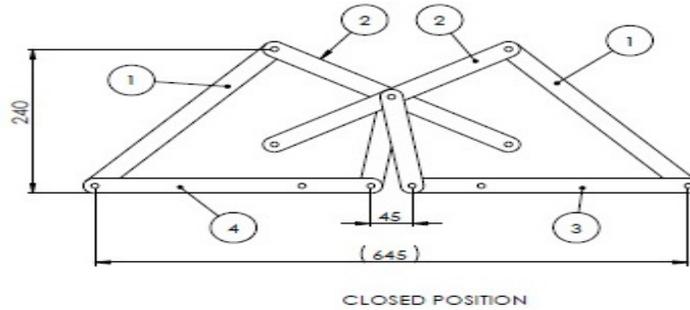


Fig11: Closed Position

Closed position will activate scraper board material removing action and stop valve flow, as piston attached to link 1, 2 will be on top head and will closed the path for flow through cylindrical inlet housing.

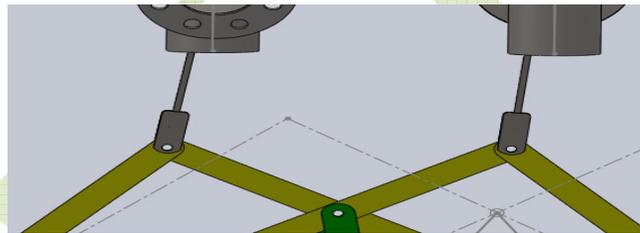


Fig12: Piston connection with link assembly

Open position importance

850 mm total length as shown in link assembly diameter and 125 mm top stroke height,

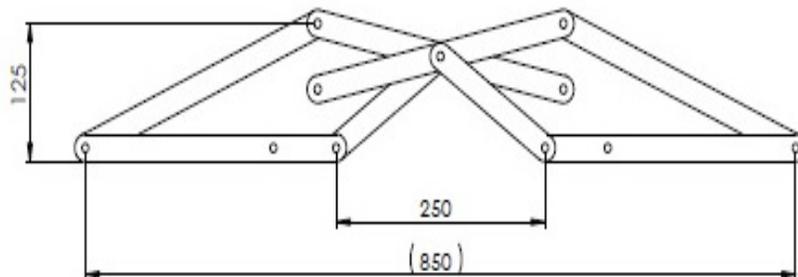


Fig13: Open position

Open position link assembly allows inlet flow active and scraper board deactivate. Since 205 mm stroke is enough to make scraper board reaching and spacing from filter disc medium. Cylindrical inlet housing designed as per the stroke we got from top head link.

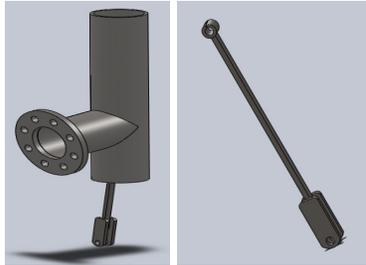


Fig14: cylindrical inlet housing piping and piston assembly.

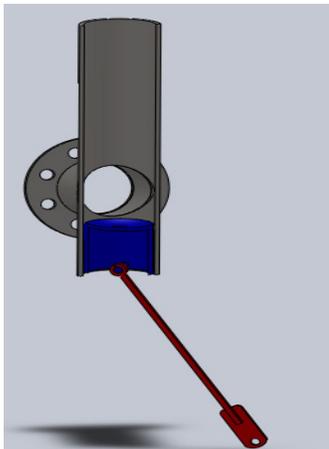


Fig15: Valve Open position

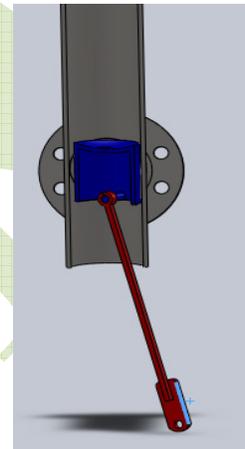


Fig16: Valve Closing Position

Valve opening and closing action will be at the linear stroke of 205 mm. Inlet will be stopped when link assembly will take top head stroke of 115 mm. These kind of two units will have to install in single link assembly to stop two inlet flows. as filter setup is having two inlet sprays to pass the material flow.

RESULTS

$240 - 125 = 115$ mm stroke on top head we are getting $850 - 645 = 205$ mm in linear stroke we are getting that is sufficient as per input.

CONCLUSION

Working of link valve is possible by making this assembly together for multi actuation applications.

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