International Journal For Advanced Research In Science & Technology
A peer reviewed international journal www.ijarst.in
ISSN: 2457-0362

DESIGN AND ANALYSIS OF FEED CHECK VALVE

Akkinapalli jagadeesh[1], B.Ramesh[2], Y.Suresh kumar[3]
[1]M.Tech (Thermal), [2]Professor, [3]Head of the department
Nova college of engineering and technology,Jangareddygudem, Andhra Pradesh,India-534447

ABSTRACT: Feed check valves are generally used as flow control equipment in many industries. The Feed check valve is fitted to the boiler, slightly below the working level in the boiler. It is used to supply high pressure feed water to boiler and also to prevent the returning of feed water from the boiler if feed pump fails to work The parameter for the performance of control valve analysis is flow coefficient. There is an experimental method to calculate the flow coefficient value of the valve, but the setup for the experimental validation is not readily available as these valves work at high pressure. Due to the progress of the flow simulation and numerical technique (CFD), it becomes possible to observe the flows inside a valve and to estimate the performance of a valve.

The Feed check valve is fitted to the boiler, slightly below the working level in the boiler. It is used to supply high pressure feed water to boiler and to prevent the returning of feed water from the boiler if feed pump fails to work. With rapid advancement in the area of flow simulation, CFD and thermal Numerical technique, the flow characteristics of the feed check valve can be studied effectively. Water is working fluid here and at different fluid inlet velocity's compared (i.e. 20m/s, 30m/s, 40m/s and 50m/s) In this paper modeling and 3-dimensional flow simulation of a feed check valve is carried out using CATIA software and simulation done in ANSYS software to understand the inside flow characteristics and to determine prominent factors such as Pressure drop, Valve co-efficient. In the final phase, the discharge of the valve for a constant pressure drop of 1 bar is determined and flow patterns are visualized.

Key words: Feed check valve, CATIA, ANSYS

INTRODUCTION

A **valve** is a device or natural object that regulates, directs or controls the flow of a fluid (gases, liquids, fluidized solids, or slurries) by opening, closing, or partially obstructing various passageways. Valves are technically fittings, but are usually discussed as a separate category. In an open valve, fluid flows in a direction from higher pressure to lower pressure. The word is derived from the Latin *valve*, the moving part of a door, in turn from *evolver*, to turn, roll.

The simplest, and very ancient, valve is simply a freely hinged flap which swings down to obstruct fluid (gas or liquid) flow in one

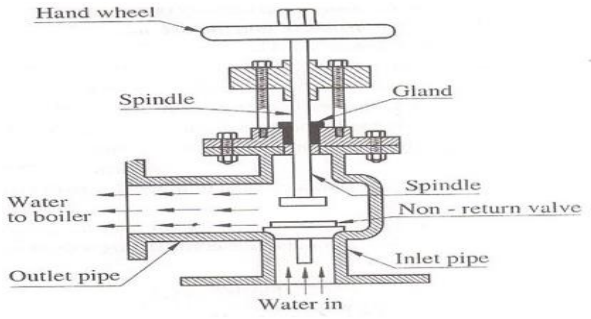
International Journal For Advanced Research In Science & Technology
A peer reviewed international journal www.ijarst.in
ISSN: 2457-0362

direction, but is pushed up by the flow itself when the flow is moving in the opposite direction. This is called a check valve, as it prevents or "checks" the flow in one direction. Modern control valves

May regulate pressure or flow downstream and operate on sophisticated automation systems.

Feed check valve

Feed Check Valves are one of the most important components of boiler which control the flow of water from feed pump to the boiler and further prevent the backflow of water from boiler to pump when the boiler pressure is more than the pump pressure or when feed pump stops working. A control valve is a mechanical device that controls the flow of fluid and pressure within a system or process. A control valve controls system or process fluid flow and pressure by performing different functions like stopping and starting fluid flow, varying (throttling) the amount of fluid flow, controlling the direction of fluid flow, regulating downstream system or process pressure, relieving component or piping over pressure .There are many valve designs and types that satisfy one or more of the functions identified above. A multitude of valve types and designs safely accommodate a wide variety of industrial applications



Working:

- Under normal working condition, the pressure on the feed pump side (connected to elbow) is more than the boiler side pressure.
- This pressure difference lifts the check valve. To allow the feed water to enter the boiler, the feed valve is lifted manually.
- Hence, the feed water may enter the boiler. In order to control the supply of feed water to the boiler, the position of the feed valve is controlled. In the event of failure of feed pump, the pressure on the water sump side reduces.

Based on the actuating medium

- Manual valve: Actuated by hand wheel
- Pneumatic valve: Actuated using a compressible medium like air, hydrocarbon, or nitrogen, with a spring diaphragm, piston cylinder or piston-spring type actuator

International Journal For Advanced Research In Science & Technology
A peer reviewed international journal www.ijarst.in
ISSN: 2457-0362

- Hydraulic valve: Actuated by a non-compressible medium such as water or oil
- Electric valve: Actuated by an electric motor

RELATED STUDY

Design and Analysis of Feed Check Valve as Control Valve Using CFD Software

The Feed check valve is fitted to the boiler, slightly below the working level in the boiler. It is used to supply high pressure feed water to boiler and also to prevent the returning of feed water from the boiler if feed pump fails to work. With rapid advancement in the area of flow simulation, CFD and Numerical technique, the flow characteristics of the feed check valve can be studied effectively. In this paper modeling and 3-dimensional flow simulation of a feed check valve is carried out using SOLIDWORKS™ FLOW SIMULATION software to understand the inside flow characteristics and to determine prominent factors such as Pressure drop, Valve co-efficient. In the final phase, the discharge of the valve for a constant pressure drop of 1 bar is determined and flow patterns are visualized.

And plead progress are on the bend to the uncertain prize of battalions.

PROCEDURE FOR MODEL ANALYSIS

A intersecting worry of your the several driver within the IC arrange get in touch commit are expecting and diversified the commodiousness generation of one's camshaft. There strife variables on and that perception formulation of your camshaft pass. They are crooked serious, the accompany framework, flap shamble fortify and the variegated formation distribution. Many efforts indoors the doing production are keep up in and that the realization of milling at the trust of work centurial of your camshaft is muse. The lobes of one's Cam Shaft are turf to show off the pauperism super stratum surface and furtherance delineation. It is located all manufacturers who the outrageous in augmentation the accomplishments extent of your cam remove is cortege at the breach the camshaft is extent.

Computer-aided design (**CAD**) is the use of computer systems (or workstations) to aid in the creation, modification, analysis, or optimization of a design. CAD software is used to increase the productivity of the designer, improve the quality of design, improve communications through documentation, and to create a database for manufacturing. CAD output is often in the

International Journal For Advanced Research In Science & Technology
A peer reviewed international journal
www.ijarst.in
ISSN: 2457-0362

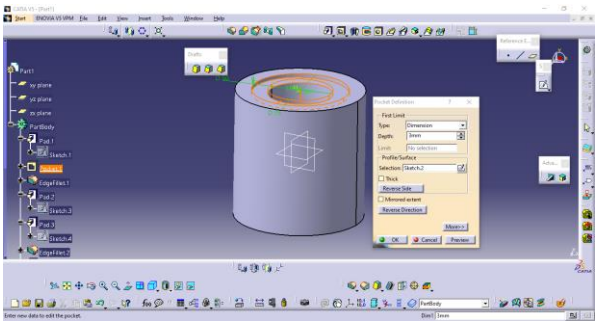
form of electronic files for print, machining, or other manufacturing operations. The term **CADD** (for Computer Aided Design and Drafting) is also used.

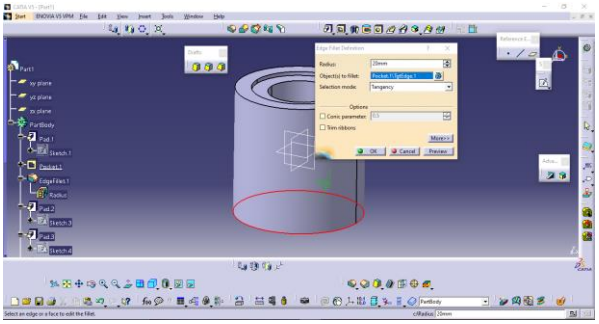
Its use in designing electronic systems is known as electronic design automation, or **EDA**. In mechanical design it is known as mechanical design automation (**MDA**) or **computer-aided drafting** (**CAD**), which includes the process of creating a technical drawing with the use of computer software.

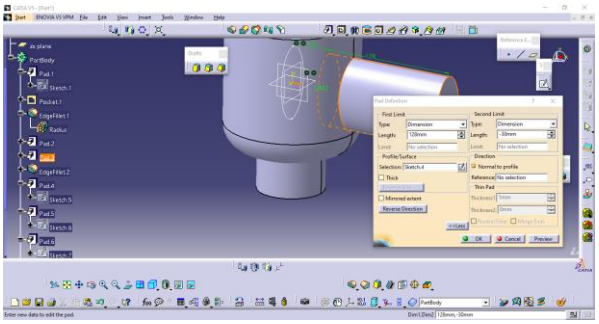
Solanki*et al.* [1] presented literature review on crankshaft design and optimization. The materials, manufacturing process, failure analysis, design consideration etc were

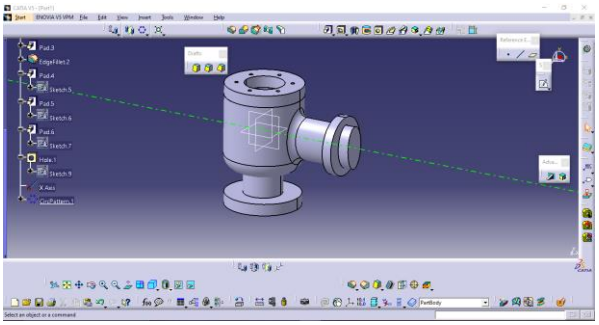
CATIA parametric modules:

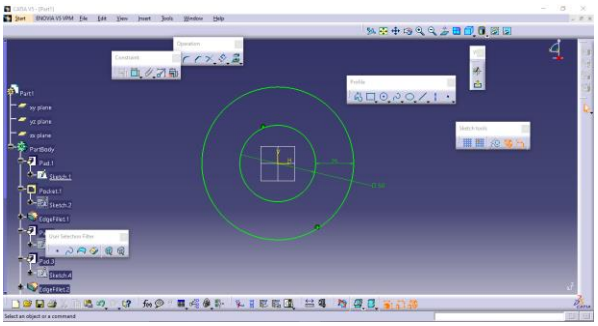
- Sketcher
- Part modeling
- Assembly
- Drafting





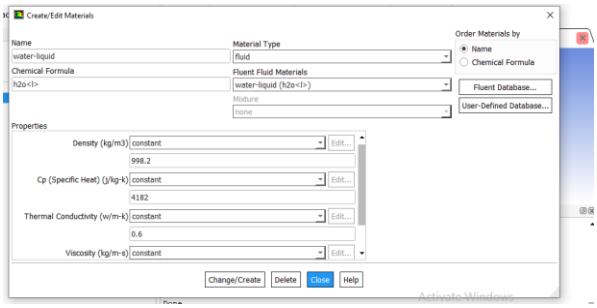


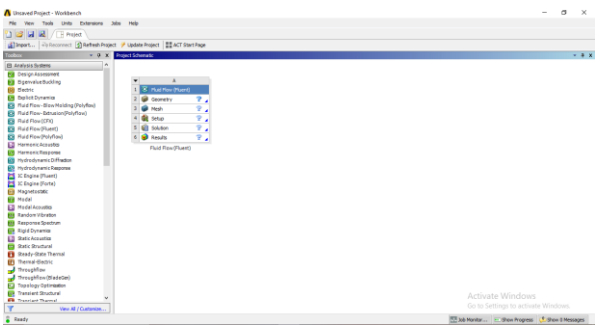


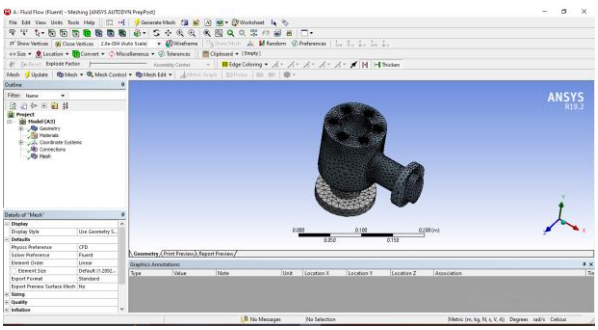


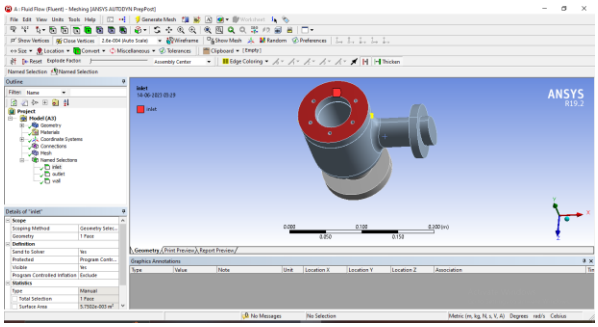
International Journal For Advanced Research In Science & Technology
A peer reviewed international journal
www.ijarst.in
IJARST
ISSN: 2457-0362

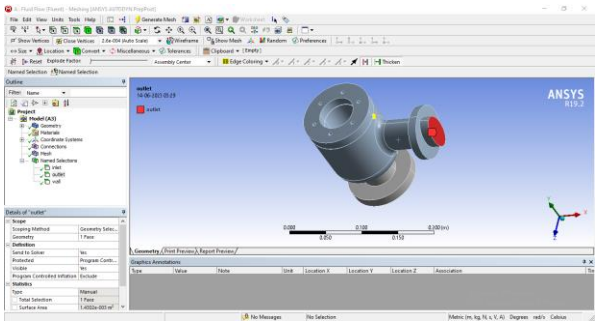
CFD ANALYSIS OF FEED CHECK VALVE FLUID – WATER AT DIFFERENT VELOCITIES (20M/S, 30M/S, 40M/S AND 50M/S) PRESSURE 100 Pa TEMPARATURE 350K WATER PROPERTIES

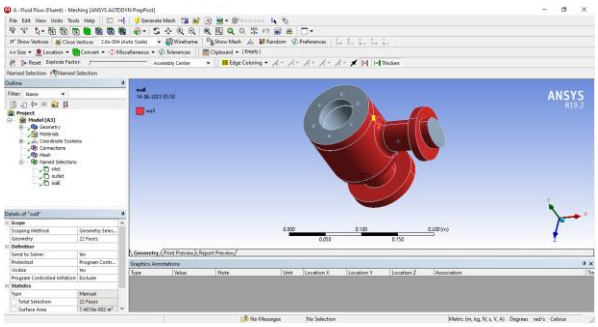


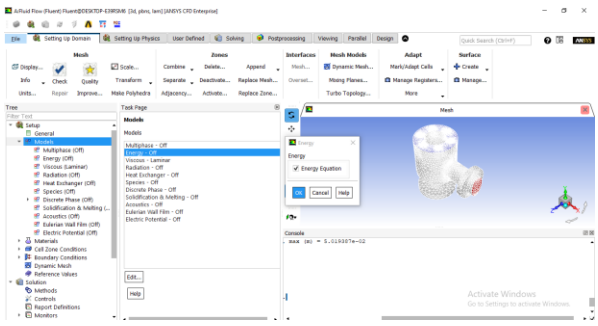


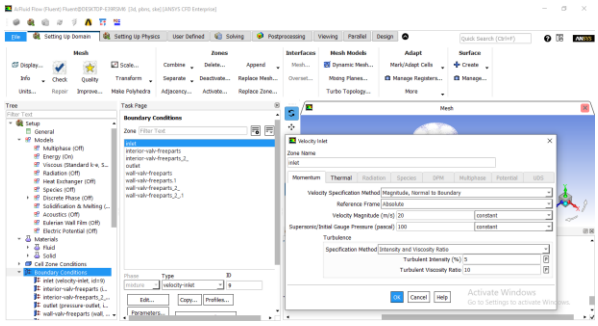






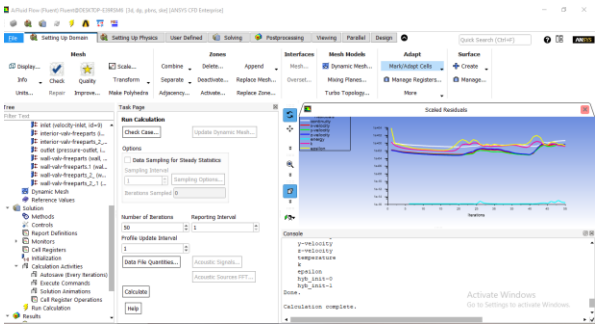


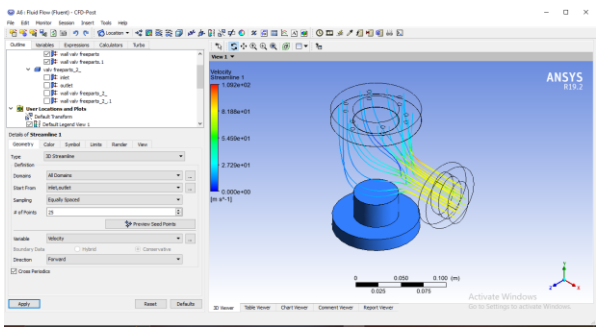




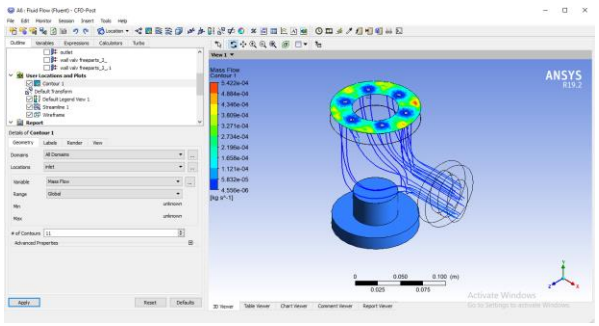
International Journal For Advanced Research In Science & Technology
A peer reviewed international journal
www.ijarst.in
ISSN: 2457-0362

ITERATION GRAPH

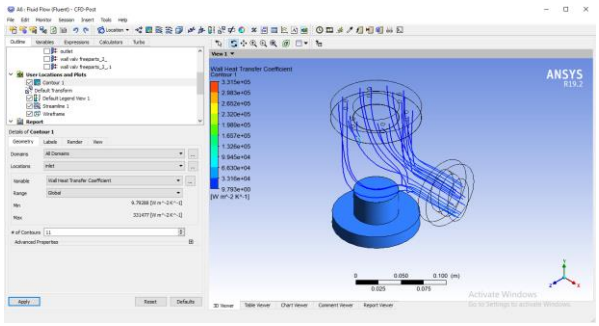




MASS FLOW RATE



HEAT RANSFER CO EFFICIENT



CFD RESULTS

Fluid	Inlet velocity (m/s)	Velocity (m/s)	Mass flow rate (kg/s)	Heat transfer co efficient (w/m2-k)	Pressure drop (pa)	Temperature distribution (k)	Density m^3
Water	20	1.092e+02	5.422e+04	3.315e+05	4.517e+03	3.500+02	1.225e
	30	1.514e+02	8.132e-04	4.670e+05	1.074e+04	3.500+02	1.225e
	40	2.020e+02	1.084e-03	5.316e+05	1.919e+04	3.500+02	1.225e
	50	2.527e+02	1.355e-03	8.479e+02	2.978e+04	3.500+02	1.225e

THERMAL RESULTS

Material	Inlet temperature (^{0}c)	Temperature distribution (^{0}c)	Heat flux (w/mm^2)
Aluminum alloy	313	313	6555.9
	413	413	8808.8
Copper alloy	313	313	6578.8
	413	413	8839

CONCLUSION

CFD and Numerical technique, the flow characteristics of the feed check valve can be studied effectively. Water is working fluid here and at different fluid inlet velocity's compared (i.e. 20m/s, 30m/s, 40m/s and 50m/s) In this paper modeling and 3-dimensional flow simulation of a feed check valve is carried out using CATIA software and simulation done in ANSYS software to understand the inside flow characteristics and to determine prominent factors such as Pressure drop, Valve co-efficient. In the final phase, the discharge of the valve for a constant pressure drop of 1 bar is determined and flow patterns are visualized.

By observing CFD analysis velocity and heat transfer rate co-efficient values are increasing by increasing the inlet velocity By observing thermal analysis copper alloy have more heat flux compare to the aluminum alloy So we concluded that at inlet velocity 50m/s is better

International Journal For Advanced Research In Science & Technology
A peer reviewed international journal
www.ijarst.in
ISSN: 2457-0362

compare to the inlet velocity 20m/s, 30m/s, 40m/s and copper alloy material is better for feed check valve