Modeling and Analysis of Hydrant Clutch

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Abstract:

Underground hydrant is a component used in underground piping's for an australian based company.This hydrant is used in outdoor firefighting system, which enables firefighters to tap into the municipal water supply assist in extinguishing a fire.This is also used in many conventional daily user like fertilizer pumps , gas pipelines etc…, where the pressure is to be released or outlet is to be provided without any leak.The actual use is that it acts as a stopper at the outlet provided , and the two hooks on the top help in locking the device tapped into it.As this hydrant is subjected to huge pressure , the chances of failure are more on this , if not designed properly.This hydrant is subjected to strength analysis using 2Tr of loads with two different materials , one is the conventional material ,ie ductile cast iron , and other is Kevlar - 29In this project we are modeling the hydrant by using Pro-e and analysis is done by using Ansys while doing the analysis we are comparing the results with the actual cast iron material with the kevlar material wich is used mostly in clutch plates as a friction material.

Keywords: *ANSYS, Clutch, Hydrant, Pressure, Pro-E.*

I. INTRODUCTION

A hydrant is an outlet from a fluid main often consisting of an upright pipe with a valve attached from which fluid (e.g. water or fuel) can be tapped. A fire hydrant (also known colloquially as a fire plug in the United States or as a Johnny pump in New York City),[1] is an active fire protection measure, and a source of water provided in most urban, suburban and rural areas with municipal water service to enable firefighters to tap into the municipal water supply to assist in extinguishing a fire. Buildings near a hydrant may qualify for an insurance discount since fire-fighters should be a concept of fire plugs dates to at least the 17th century. This was a time when firefighters responding to a call would dig down to the wooden water mains and hastily bore a hole to secure water to fight fires. The water would fill the hole creating a temporary well, and be transported from the well to the fire by bucket brigades or, later, by hand-pumped fire engines. The holes were then plugged with stoppers, normally redwood, which over time came to be known as fire plugs. The location of the plug would often be recorded or marked so that it could be reused in future fires. This is the source of the colloquial term fire plug still used for fire hydrants today. After the Great Fire of London in 1666, the city installed water mains with holes drilled at intervals, equipped with risers, allowing an access point to the wooden fire plugs from street level.

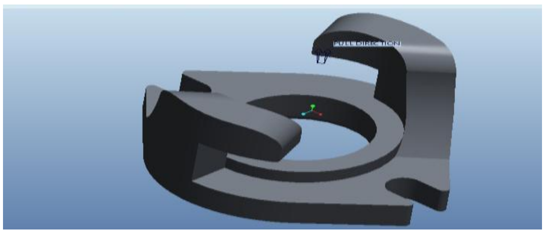

Fig.1 basic hydrant model

1.1 Making procedure of hydrant using Die casting

Die casting is a versatile process for producing engineered metal parts by forcing molten metal under high pressure into reusable steel molds. These molds, called dies, can be designed to produce complex shapes with a high degree of accuracy and repeatability. Parts can be sharply defined, with smooth or textured surfaces, and are suitable for a wide variety of attractive and serviceable finishes.Die castings are among the highest volume, mass-produced items manufactured by the metalworking industry, and they can be found in thousands of consumer, commercial and industrial products. Die cast parts are important components of products ranging from automobiles to toys. Parts can be as simple as a sink faucet or as complex as a connector housing.Die casting is a method of producing alloy castings by injecting molten metal into metallic mold under pressure. Die casting process can be classified into

a) Hot Chamber Process

b) Cold Chamber Process

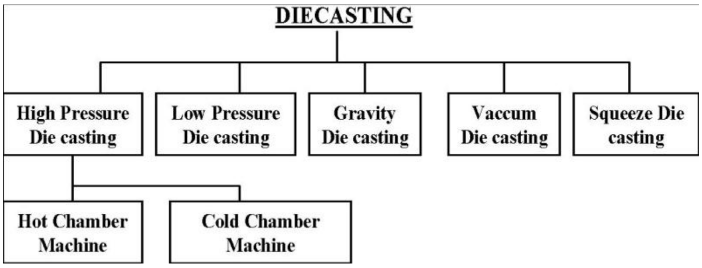

Fig.2 die-casting procedure for making hydrant

II. MODELING OF HYDRANT USING PRO-E

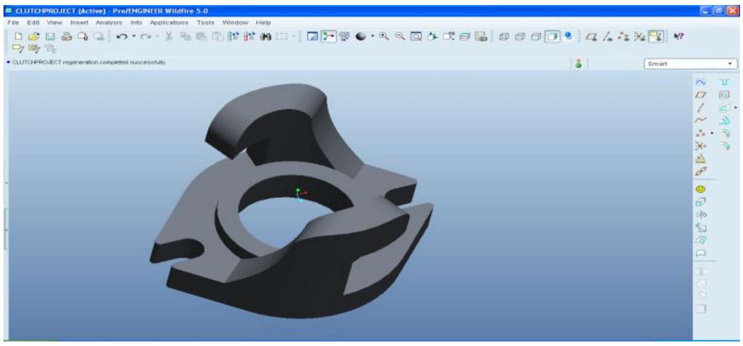

Fig.3 the generated model using pro-e

2.1 Analysis of hydrant

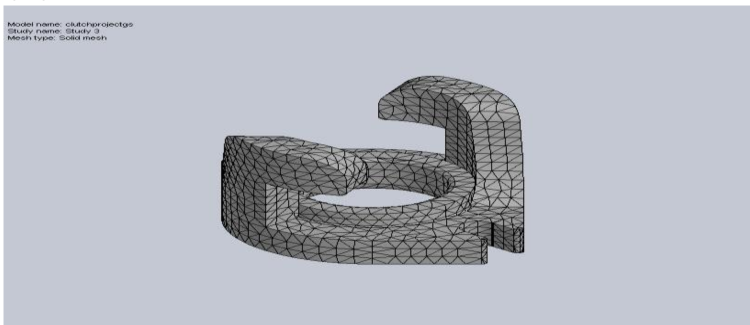

Fig.4 meshed model of hydrant

III. RESULTS & DISCUSSION

3.1 Cast-iron hydrant

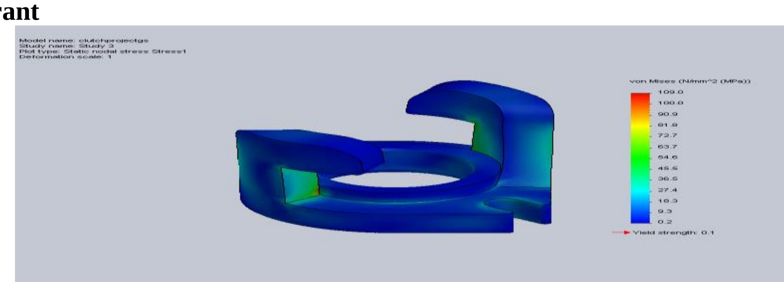

Fig.5 stress intensity of cast-iron hydrant

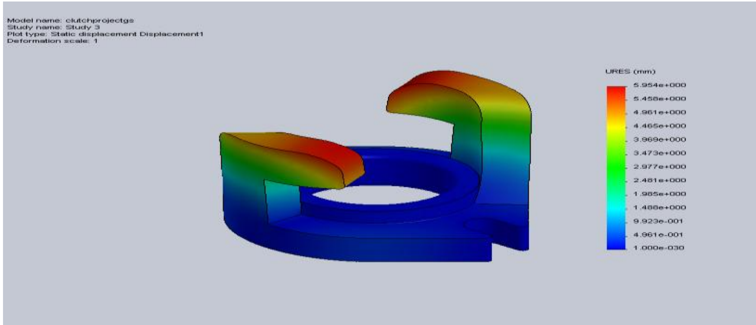

Fig.6 displaced shape of cast-iron hydrant

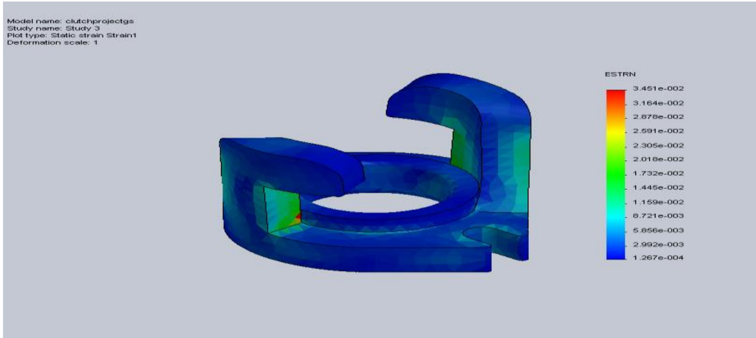

Fig.7 stain intensity of cast-iron hydrant

3.2 Kevlar hydrant

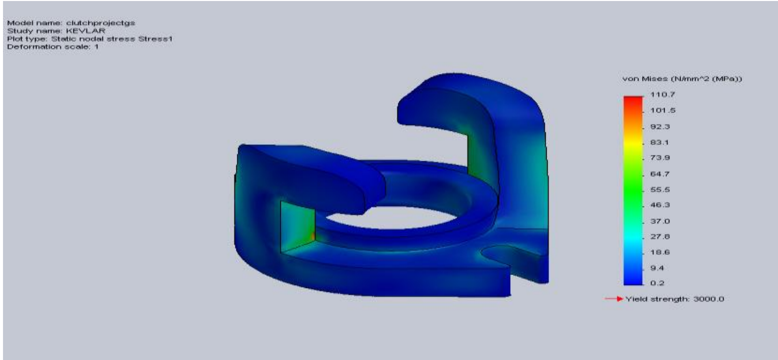

Fig.8 stress intensity of Kevlar hydrant

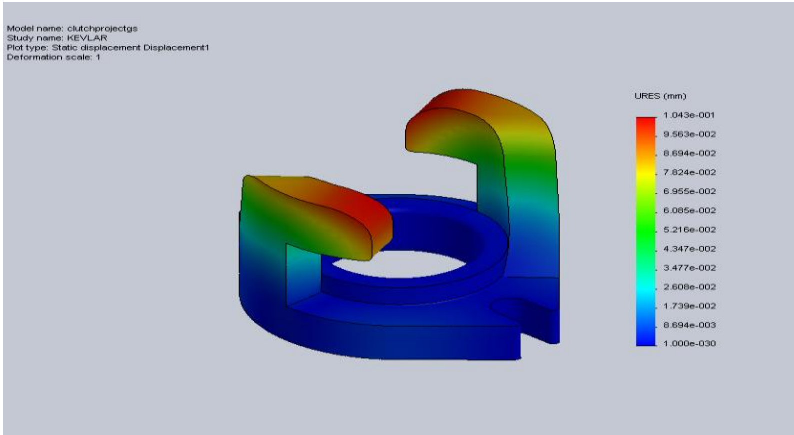

Fig.9 displaced shape of Kevlar hydrant

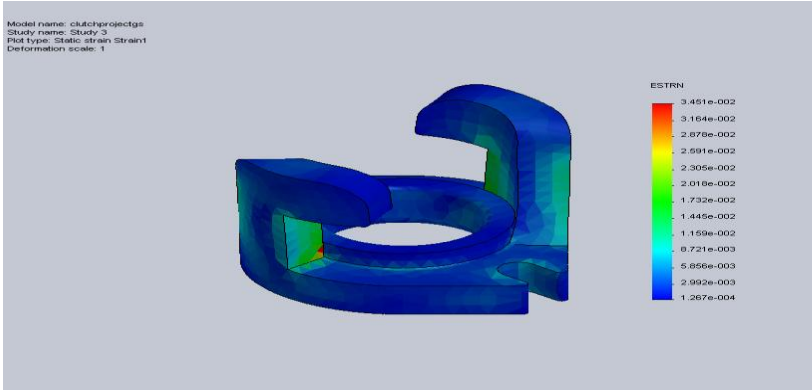

Fig.10 stain intensity of Kevlar hydrant

	STRESS(N/mm$^{2)}$	DISPLACEMENT(mm)	STRAIN
CAST IRON	109.028	5.953	0.0345
KEVLAR FIBER	110.747	0.104	6.198e^{-4}

Table.1 results comparison of cast-iron and Kevlar

IV. CONCLUSION

In my thesis, We have Modeled a hydrant clutch which is used in underground water supplying pipelines for industries.The modeling is done in Pro/Engineer.Presently we are using cast iron material to produce hydrant clutch.In this project we have analyzed hydrant clutch using " COSMOS " FEM based software by applying CAST IRON and KEVLAR material properties.We have replacing material with Kevlar Fiber since its density is less than that of Cast Iron, thereby reducing the weight of the componentBy observing the displacement, stress and strain we are concluding that KEVLAR is better option to manufacturing of hydrant clutch.By observing the results, using Kevlar for Hydrant clutch is safe.And we have designed mould tool for the same and generated CNC codes for the core and cavity.

REFERENCES

[1]. Machine design by r.s. khurmi
[2]. Psg, 2008."design data," kalaikathir achchagam publishers, coimbatore, india
[3]. Intelligent Systems": A Comparative StudyHindawi Publishing Corporation Applied Computational Intelligence and Soft Computing Volume 2011, Article ID 183764, 18 pages.
[4]. Abbas Fadhel Ibraheem, Saad Kareem Shather & Kasim A. Khalaf, "Prediction of Cutting Forces by using Machine Parameters in end Milling Process", Eng.&Tech. Vol.26.No.11, 2008.
[5]. S. Abainia, M. Bey, N. Moussaoui and S. Gouasmia." Prediction of Milling Forces by Integrating a Geometric and a Mechanistic Model", Proceedings of the World Congress on Engineering 2012 Vol III WCE 2012, July 4 - 6, 2012, London, U.K.
[6]. Md. Anayet u patwari, a.k.m. nurul amin, waleed f. Faris, 'prediction of tangential cutting force in end milling of Medium carbon steel by coupling design of experiment and Response surface methodology'. Journal of mechanical engineering, vol. Me 40, no. 2, December 2009 Transaction of the mech. Eng. Div., the institution of engineers, Bangladesh.
[7]. Smaoui, M.; Bouaziz,z. &Zghal,A., 'Simulation of cutting forces for complex surfaces in Ball-End milling', Int j simul model 7(2008) 2,93-105.
[8]. Pro/Engineer Wildfire 2.0 by Steven G. Smith
[9]. Handbook of Die design by By Ivana Suchy
[10]. Product Design and Manufacturing by R.C. Gupta and A.K. Chaitle
[11]. Fundamentals of Die Casting Design Genick Bar–Meir, Ph. D.