Advanced safety braking system by using Controlled fluid flow

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***Abstract*— Our project is to prevent the slipping effect during brake been applied. When we go on the bike in very high speed, at sudden time the brake applied in the bike will be change to uncontrolled condition. Due to uncontrolled condition the accident will be occurs and it leads to death, these drawbacks are minimized in our project to control the speed in bike at any speed without slipping. The drawbacks are minimized by using ECM (Electric Control Module), Tacho s ensors, Flow contol valves. And also the inertia force is created by using electromagnetic force.**

***Keywords*— Control valve, Sensors and Electric control module.I.**

INTRODUCTION

With the development of modern vehicles chassis and wheel control system, such as anti-lock braking system (ABS), the system of regenerative braking (RBS) and Stability control(ESC) for using brakes, for EVs etc., There comes a new requirement for the vehicle brake system, that is the accuracy of the control wheel brake oil pressure, The electro hydraulic braking system (EHS), which has a ability to adjust the fore wheel brake pressure independently can be good match with the system however ,the traditional control logic of EHB is based on the PWM (Pulse Width Modulation) but it which has a electromagnetic valves low control accuracy of linear and not precise fluid flows, so due to overcome the drawbacks, the research idea is first to analyse the working mechanism of the ABS brake and other hydraulic fluid used brakes.

The analysis based with hydraulic lines and the electromagnetic analysis. And finally the fluid flow is controlled with electrically which in the flow is depend upon the wheel speed. The ECM (Electro Control Module) is coded with output flow data, which the hydraulic fluid flow to disc drum depend upon the ECM data. In the ECM data the output flow is depend upon the wheel speed, and it can change independently, when the lever is operated the sensor senses the final wheel rpm and it goes to ECM and that same time ECM analyze the required output flow depends upon the wheel speed and ECM stored data, then the other process of the inertia to wheel is manually created by using with electromagnet, so it is used to stop the wheel without any slipping.

II. LITERATURE SURVEY

Saeed Abu Alyazeed Albatlan, Schmittner B (2003) studied During the process of the brakes the performance of the brake fluid in the brake pipe is one element that has a huge consequence on feel and on fleeting pressure characteristics. This paper investigates the effect of fitting a brake pipe with dissimilar inner diameters to each wheel at the rear axle on the brake act. The experimental results showed the improvement of the car brake effectiveness and the brake balance when fitting a brake pipe with the same inner diameter for all back wheel. The experimental results showed the occurrence of outer wheel lock after the inner one with a overlap time depending on the variation of load distribution and inner diameter of brake pipes between two sides. Experimental results showed improvement in vehicle dynamics, due to improved brake force distribution for each wheel.[1]

Leonardo De Novellisa et al.(2004) studied This paper presents a direct yaw moment controller based on the arrangement of feed frontward and responded contributions for continuous yaw rate control. When the estimated sideslip exceeds a pre-defined verge, a sideslip-based on the yaw moment and all yaw moment contributions are entirely tunable all the way through model-based approach, for reduced vehicle testing time. The purpose of the controller is to continuously modify the vehicle under steer characteristic in quasi-static conditions and increase yaw and sideslip damping during transients. The overall control structure, including feed forward and response yaw rate and sideslip controllers, is characterized by simplicity and ease fine-tuning, and does not require heavy computational performance of the control unit installed on the vehicle. The actual possibility and effectiveness of the model-based automatic fine-tuning response part of torque-vectoring controller, based on a atom swarm optimization algorithm, was demonstrated by better experimental output and the outstanding fit between the simulation model results and the experiments. [2]

Bhau K. Kumbhara et al. In this study, various electrolytic and carbonyl iron powder based MR fluids have been synthesize by mixing grease as a

stabilizer, oleic acid is an antifriction additive and gaur gum powder as a surface coating to reduce synthesize by mixing grease as a stabilizer, oleic acid is an antifriction additive and gaur gum powder as a surface coating to reduce agglomeration of the MR fluid . The MR fluid sample is based on sunflower oil, which is bio-degradable, ecological friendly and in abundance available have also been synthesized. MRF samples Csu 60% and Esu 60% cannot meet the requirements of braking applications but they may be used for low yield stress applications. The difference between the OFF state viscosities of examine the sample is very small, however the ON state shear strength produced by them be significant. MR fluid sample with OFF state viscosity 0.32 Pa could produce shear strength of only about 40.64 kPa, whereas with 0.7 Pa OFF state viscosity MR fluid sample Csi 45% has developed highest shear strength of 92.34 kPa. CI powder is better for MR fluid samples and also used for braking application as compared to the EI powder as it produces considerably higher saturation magnetization. [3]

R. Jegadeeshwaran et al. This study is one such attempt to perform the situation monitoring of a hydraulic brake system by vibration analysis. From this research, the performance of a Colonel Selection Classification Algorithm (CSCA) for braking fault diagnosis has been reported. A hydraulic brake system investigation assemble was fabricated. Under good and fault conditions of a brake system the vibration signals were acquired by using a piezoelectric transducer. From the study the CSC algorithms were found to be good contender and it can be used for practical application for fault diagnosis of a hydraulic brake system. It creates a hope for a better practical model for the brake fault analysis study, which would save many lives from the accident. [4]

Jonas Ostha et al. In the present study, an anticipatory postural response was hypothesized, modeled in a whole-body HBM with feedback controlled brute force, and validated using accessible volunteer data. The anticipatory response was modelled as a time dependent change in the situation value for the feedback controllers, which generates correcting moments to offset the braking deceleration. To conclude, driver anticipatory postural responses during driver braking were modelled in an HBM during changes of the orientation positions for feedback controllers that regulate muscle activation levels. The addition of preventative postural control muscle activations could explain the difference in occupant kinematics between driver and self-sufficient braking. [5]

D.S. Yawas et al. The development of asbestos-free automotive brake pad by periwinkle shell particles as frictional stuffing material is presented. This was with a view to exploit the individuality of the periwinkle shell, which is largely deposited as a waste, in replacing asbestos which has been found to be carcinogenic. There was good interfacial bonding as the particle size of periwinkle shell was decreased from 710 to 125 μm. Compressive strength, hardness and density of the developed brake pad sample were seen to be growing with falling the particle size of periwinkle shell from 710 to 125 μm, while the oil soak, water soak and wear rate is decreased with declining of the particle size of periwinkle shell. [6]

S.G. Amaren et al. The wear test was performed by using pin on disk machine with varying the sliding speed, applied load, temperatures and periwinkle shell particle size. The full factorial design of four factor-two level analysis of discrepancy were used in the study of the wear test. The results shown that wear rate increases with mounting the sliding speed, load, temperatures and periwinkle particle size. The wear rate increases with increasing the sliding speed, load, temperature and periwinkle particle size. The results of this research shows that periwinkle shell particle can be effectively used as a replacement for asbestos in brake pad manufacture. [7]

K.K. Ikpambese et al. In this study, asbestos-free automotive brake pads produced from palm kernel fibers with epoxy-resin binder was evaluate. Resins wide-ranging in formulations and property such as friction coefficient, wear rate, stiffness test, porosity, noise level, temperature, specific gravity, stopping time, humidity effects, surface irregularity, oil and water absorptions rates, and microstructure examination were investigated. The results also show that porosity, hardness, humidity content, specific enormity, surface roughness, oil and water combination charge stay with constand speed. The result of microstructure verify exposed that worm surfaces were characterized by scrape wear where the asperities be ploughed thereby exposing the white region of palm kernel fibers, thus increasing the softness of the resistance materials. [8]

Ossama Mokhiamar et al., this paper proposes a control design concept for an best allocation of longitudinal and lateral forces of the four tires of a towing vehicle. The mean objectives of the control system were to become stable the motion of an articulated vehicle utilize the tires entire ability in both longitudinal and lateral guidelines as well as to make the handling characteristics of an articulated vehicle similar to those of a single one. The influence of independent steer and drive/or brake force distribution on the expressed vehicle management individuality is examine, near the limit area, the two controllers stabilize the combined vehicle motion. However, the effect of the proposed finest control is

more obvious especially on the retort of the preview part. In additional severe situation, articulated vehicle running on low friction coefficient road, the combined control-type of DYC, RWS, FWS are failed to achieve a desirable reaction. [9]

Ahmed M. El-Garhya et al. this paper proposes a Fuzzy Logic based Life - Extending Control (FLEC) system for growing the service life of the ABS. FLEC achieves significant development in service life by the trade-off between reasonable active performance and safe operation. The proposed FLEC incorporate structural damage mock-up of the ABS. The model utilizes the dynamic behavior of the ABS and predicts the wear rates of the brake pads/disc. The results of the designed FLEC shows the wear rate of brake disc/pads is abridged brake and its temperature is reduce the end of braking which reduces the brake vanishing effect, i.e decrease the abrasion coefficient between brake disc and pads. [10]

IV. PROBLEM IDENTIFICATION

- The sudden brake will cause the bike to slipping effect
- Uncontrolled hydraulic oil to be flow on the brake shoe which causes to slip
- At very high speed the sudden brake will cause accident.

V. THE OBJECTIVES OF THIS WORK ARE OUTLINED AS FOLLOWS

- Our project is to prevent the accident at sudden brake
- It also used to reduce the slipping effect
- This project also used to produce the brake to stop the vehicle at short distance during at high speed.

VI. WORKING

The advanced safety braking system which fully controlled by ECM (Electric Control Module). The speed sensor which is placed in the rear wheel, which is send, the speed signal to the electric control module.

The ECM is used to receive the signal from the sensor and used to control various function. When the brake is applied the hydraulic oil sump is operated. The sensible solenoid valve is placed on the throttle (fluid flow to control).

The sensible solenoid valve is operated by ECM which is used to control the hydraulic oil according to the wheel speed at the end of the brake been applied. The controlled hydraulic oil is passing to the brake shoe and the controlled amount of brake pressure is applied in the brake drum.

Electromagnetic control system is used. Which create the opposite force on the wheel. Which it cause to create the inertia force for the revolution.

VII. RESULT AND CONCLUSION

From we were studied, the all type of brake had some disadvantage so to overcome the failure ,the ASBS (Advance Safety Braking System) is introduced with safety modulation and safety equipments from the all type of brake we know about some failure with help of many review models. In ESC (electronic stability control) is only used in four wheeler but here with in two wheeler the traction control is very difficult and also the ABS (Anti-iock braking system) have many difficulties, that is the inconsistent stop time is occurred that means the stopping distance for regular condition are lengthened by their ABS, either because there may be errors in the system ,or because the chunkier or noise of the ABS may contribute to the driver not braking at the same rate, so in our project the inconsistent stop time is managed with automatic stable control and also our project result is familiar to our thought.

REFERENCES

1. Saeed Abu Alyazeed Albatlan, Schmittner B (2003) Das Hybrid-Bremssystem – die Integration von ESP, EMB und EPB. In: Veranstaltungsunterlagen Autotec 2003.
2. IIR Deutschland GmbH, Baden-Baden (Hybrid brake system – integration of ESC, EMB and EPB. In: Proceedings of Autotec 2003. IIR Germany GmbH, Baden-Baden)
3. Leonardo De Novellisa, Schmittner B (2004) Das Hybrid-Bremssystem – die Markteinführung der elektromechanischen Bremse EMB. In: Veranstaltungsunterlagen Bremstech Konferenz. TÜV Automotive GmbH/TÜV Akademie/TÜV Süd Gruppe, München (Hybrid brake system – market introduction of the electro-mechanical brake EMB. In: Proceedings of Braketech conference, TÜV Automotive GmbH/TÜV Academy/TÜV Group South, Munich)
4. Bhau K. Kumbhara, Stemmer M, Münchhoff J, Schuster A (2012) Audi R8 e-tron: Pilotumsetzung und Potentialstudie des innovativen elektromechanischen Bremssystems EHCB. In: Veranstaltungsunterlagen 2. VDI-Fachkonferenz Innovative Bremstechnik. VDI Wissensforum GmbH, Stuttgart (Audi R8 e-tron: Pilot realization and feasibility study of the innovative electromechanical brake system EHCB. In: Proceedings of 2. VDI conference innovative brake technology, VDI Knowledge Centre GmbH, Stuttgart)
5. R. Jegadeeshwaran, Strutz T, Münchhoff J, Rahn S, Schuster A (2013) Brake by Wire Anwendung am Beispiel des Audi R8 e-tron. In: Veranstaltungsunterlagen EuroBrake 2013, Dresden (Brake by wire by the example of Audi R8 e-tron. In: Proceedings of EuroBrake 2013, Dresde

6. Jonas Ostha , Driving control architecture for six-in-wheel-driving and skid-steered series hybrid vehicles; Jaewon Nah; Seungjae Yun; Kyongsu Yi; Wongun Kim; Jongbae Kim; Electric Vehicle Symposium and Exhibition (EVS27), 2013 World; Year: 2013; pp. 1-7, DOI: 10.1109/EVS.2013.6914819.
7. D.S. Yawas, Electric Braking Control Methods for Electric Vehicles With Independently Driven Front and Rear Wheels; Mutoh, N.; Hayano, Y.; Yahagi, H.; Takita, K.; Industrial Electronics, IEEE Transactions on; Year: 2007, vol. 54, Issue: 2; pp. 1168-1176, DOI: 10.1109/TIE.2007.892731.
8. S.G. Amaren, Field and bench test evaluation of range extension control system for electric vehicles based on front and rear driving-braking force distributions; Fujimoto, H.et al.; Power Electronics Conf (IPEC-Hiroshima 2014-ECCE-ASIA), 2014 International; Year: 2014; pp. 1671-1678, DOI: 10.1109/IPEC.2014.6869807
9. K.K. Ikpambese , Model-Based Range Extension Control System for Electric Vehicles With Front and Rear Driving-Braking Force Distributions Fujimoto, H.; Harada, S.;Industrial Electronics, IEEE Transactions on; Year: 2015, vol. 62, Issue: 5; pp. 3245-3254, DOI: 10.1109/TIE.2015.2402634.
10. Ossama Mokhiamar, Single wheel drives for wheel slip control; Kaspar, S.; Stroph, R.; Pruckner, A.; Hohmann, S.; Electric Vehicle Symposium and Exhibition (EVS27), 2013 World; Year: 2013; pp. 1-7, DOI: 10.1109/EVS.2013.6915038
11. Ahmed M. El-Garhya, Bekker, M.G., Theory of Land Locomotion: The Mechanics of Vehicle Mobility, The University of Michigan Press, Ann Arbor, MI, 1956 (1962). • Bosch, R., Driving Safety Systems, SAE, 1999

