

## HYDRAULIC SECURITY WINDOW

Abraham Cyril Issac

PhD Scholar, Dept. of Management Studies, IIT Madras, Tamil Nadu, India

**Abstract** - The heart breaking and tragic train accidents occurring all across the country are deliberately demanding for a change, an improvement and above all a revolution in the security systems employed in our trains. This situation of the Indian railways has thrown a great challenge to the safety and security of millions of people who use train as their vital and moreover affordable means of transportation.

This paper is a humble advent to improve or add on to the security precautions in Indian trains. After deliberating upon the conceptual framework of Hydraulic Security Window [HSW], the present paper has dealt with its merits and demerits and its future prospects works with the help of a hydraulic system. For this purpose, instead of providing separate emergency window, all the windows of a coach are equipped with pressure pads, which are further connected to a distribution valve, and then to a master cylinder. During emergency, with the help of an emergency switch provided near the window, the master cylinder is operated and the fluid from it passes through the distribution valve and then it operates the pressure pads and thus, aids the opening of the window. This mechanism not only rises to the requirement in case of emergency, but also has added advantages like, ease of operation, less chance of failure etc. This paper can be considered as a new innovation in the field of railway security measurements.

**Key Words:** Safety, Indian railways, Security window, Mass transportation, Master cylinder

### Introduction

It has been past several years since the dome of horizon of railways as a means of transportation has arisen. In India like other countries railways are a primary mode of transportation. The availability, less cost, less duration are the added advantages of using the train rather than going for the traditional road transportation.

But, in our country, right from the installation of the first railway line, many a times we have seen deadly accidents occurring all across the nation. This is primarily due to the lack of security precautions. This paper is a humble advent to improve or add on to the security precautions.



Fig 1.1

### Subject

This work is all about the emergency exit windows installed in each compartment in our trains. At present we have two spring-controlled window in each compartment, which is controlled by a hit chain mechanism inside a glass cabinet as shown in Fig 1.2. During emergencies, the glass has to be broken and further pulling of the chain inside the cabinet facilitates the spring action. But, this is a totally obsolete method and the springs get easily damaged in such a manner that, passengers operate it directly by moving the knob and 24\*7, the windows are simply open which is very dangerous as it doesn't have any iron bars across it.



Fig 1.2

This paper deals with a system, which can deal with the emergency problem more effectively and efficiently. Instead of the conventional methodology we will be using a hydraulic mechanism. Mechanically, this is quite similar to the master cylinder installed in the vehicles under the braking system.

### System Setup

The setup and design of the system is in such a user-friendly manner that the common man can operate it very easily as well as efficiently. The master cylinder as described above acts as the kingpin factor in this entire network. Six master cylinders will be installed in a single coach which will be controlling the entire 36 windows in an L-shape manner (refer Fig. 1.3)

The pressure force generated by the master cylinder is transferred to each segment of the coach through well-directed hydraulic lines; which is further transferred to each window with the help of a distributor valve. These distributor valves are further connected to the pressure pads, which are in turn connected to the windowpanes or grill frames.

High quality, no leak pipes will be made use in this system, as these are all hydraulically activated. For newer coaches concealed piping can be carried out but for the existing ones, pipelines can be laid on the interior side of the compartment for the time being. These pipelines will go little below the window so that it won't create any discomfort to the passengers who are sleeping on the berth especially lower berth.

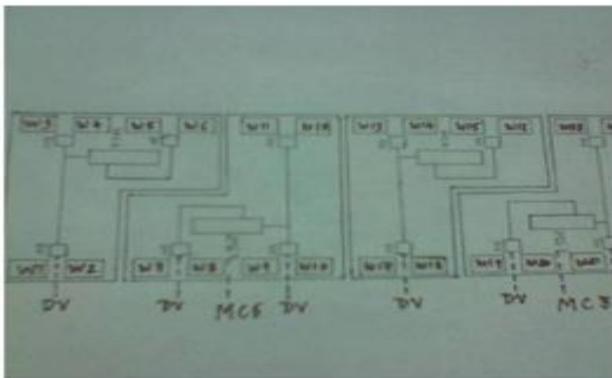


Fig 1.3

### Working

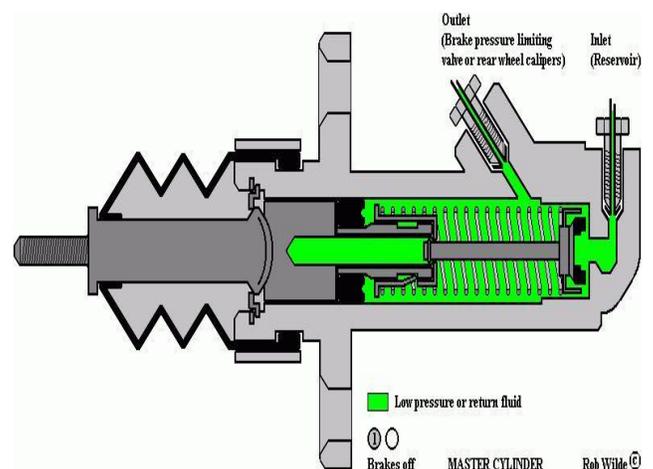
As mentioned earlier these windows come handy at the time of emergencies. During emergencies or after accidents, the strangling of coaches is very common phenomenon. These windows are useful in such horrifying situations.

During such situations when the lever is pushed [lever can be replaced by master switches for increased sophistication], it actuates the master cylinder piston [since the lever is directly connected to the master cylinder piston]. This piston forces the fluid to the pipeline so that high pressure force is created which is transferred all across the compartment through specially designed hydraulic lines. These lines are in turn connected to the distribution valve which distributes the force to the pressure pads. These pressure pads push the window grill frame upwards and the additional stopper provided at the top, holds the window in the raised position.

### Working of Master cylinder

The master cylinder is the heart of hydraulic security window system. It consists of two main chambers – the fluid reservoir, which contains the fluid to supply to the hydraulic system, and the compression chamber in which the piston operates. The reservoir supplies fluid to the hydraulic lines through ports. The larger port is called intake or filler port and is connected to the hollow portion of the piston – between the primary and secondary cups, which act as piston seal. The smaller port is called relief or bypass port, which connects reservoir directly with the cylinder and lines when the piston is in the released position.

When the lever is applied, the master cylinder piston moves forward to force the liquid under pressure into the system. The relief port is sealed out of the system. The liquid pressure is conducted to the distributor valve, where it distributes the force to the pressure pads, which are in turn connected to the windowpanes or grill frames. The additional stopper prevents the further retraction of the windows. As this is an emergency window we seldom take care of the retraction of piston.



### Merits

- Totally hydraulic, hence no external power is required.
- Less chance of failure.
- This can be easily operated by anyone, hence first to be installed in the sleeper class.
- Opens it up at great pace, i.e., rises to the need of the hour.
- Highly flexible and simple in construction and setup.
- Less maintenance required.

### De-merits

- High initial cost [installation charges quite high].
- Frequent inspection required.

### Future Prospects

As I have mentioned that this is just a beginning to revolutionize the safety and security precautions of the Indian trains. This system can be very well employed to each and every coach including the AC and the first class ones. The only difference is that in AC coaches, there will be hydraulic glass windows unlike grill windows in the sleeper class. The same mechanism applied here can be extended further to the VIP cabins and executive trains. Thus, I see all the windows of our trains getting replaced by our HSW in the nearby future, only to make a safe and secure world inside the train.

### Conclusion

**“The journey of a thousand miles begins with one step”.**

This is the first and foremost step which I take for the safety and security of the entire Indian population which travel through rail. This is a ‘spark’, an ‘initial step’, towards a big distance. As more and more accidents are occurring day by day, there is no denying the fact that this has become the need of the hour.

Safety and security has always been the primary concern of the train travelers over a period of time. This idea marks an end for such suspicions and worries. This system has the potential to solely attract a number of people towards train journey in the nearby future. This will be the first of any of such kind of hydraulic security system

installed in the Indian railways. Hence this system gets the fame for its novelty and engineering marvel. During my journey of the project I found out that ‘Failure seldom stops you. What stops you is the fear of the failure’. This shows that how optimistic I am towards the project and its success.

We- The Future Engineers- future of the nation should realize our own responsibility. I clearly understand that it is as difficult to implement an idea as it is to put up an idea. I am working strenuously for this project- its implementation, testing and above all its success. So if this paper can magnify your technical skills and give me some suggestions for its improvement, I will be very well delighted. Last, but not the least we people studying in reputed government institutions have some moral responsibility to the society, to the nation and its welfare, because **“EVERYBODY HAS TO BE SOMEBODY SOMEBODY TO BE ANYBODY OTHERWISE YOU ARE NOBODY”**.

### References

- [1] Akers Arthur, Smith Richard and Smith, Hydraulic power system analysis, Technology & Industrial Arts, CRC PRESS, 2006
- [2] Gupta R.B., Automobile Engineering, Tech India publishers
- [3] <http://www.sciencedirect.com>
- [4] [http://www.ufoindia.org/news\\_rail\\_accidents\\_UFO.htm](http://www.ufoindia.org/news_rail_accidents_UFO.htm)

### BIOGRAPHY



Abraham Cyril Issac is a Research Scholar in Department of Management Studies, at Indian Institute of Technology, Madras, India. He holds a bachelors in Mechanical Engineering from Malaviya National Institute of Technology (MNIT) Jaipur and post graduate degrees in Business Administration and Psychology from, National Institute of Technology Calicut and University of Madras respectively. He is having three years of experience in thermal powerplants as he was associated with Reliance Energy Ltd. He specializes now in Knowledge Management with special focus on a relatively new construct of Knowledge hiding. His academic interests include Knowledge Management, Behavioral Sciences, Strategic Management, Human Resource Management and Macroeconomics. Abraham Cyril Issac is the corresponding author and can be contacted at: yourcyril@gmail.com.