

## Design and Development of Power Window Mechanism for Car with Provision for Manual Operation



**P. A. Muhamed Rafi**  
Rafipal352@gmail.com  
Ph. No: 0 97384 42818

<b>Student's Name</b>	<b>P. A. Muhamed Rafi</b>	<b>PD (FT-2012)</b>
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<b>Academic Supervisor(s)</b>	C. Dileepa and Sharath S. Shirsi
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<b>Industrial Supervisor(s)</b>	
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**Abstract:**

Power windows or electric windows are automobile windows that can be raised and lowered by depressing a button or switch, as opposed to using a hand turned crank handle. It is a standard feature on most automobiles and is controlled from an array of switches located on a console either on the driver side door or a console between the front drive and passenger seat. In a typical installation, there is an individual switch at each window and a set of switches in the driver's door or a frame pillar, so that the driver can operate all the windows. As vehicles become smaller and stylish, the mechanism available for these drives systems continues to become complicated. In such situation comes the need of implementing a Manual and a Motor Driven Side Window system.

The design process started with primary research and an identified need in people with Manual and a Motor Driven side window system. Data collection has been carried out by adopting methodologies such as literature review, product study, market study and product environment study. During ethnography, an interview with stakeholders and personal interaction has been done to understand their needs and aspirations. Ergonomic study was conducted for deciding product parameters and user interface. Generation of Quality Functional Deployment (QFD) and Product Design Specification (PDS) has been based upon data analysis. Concepts have been finalized by weighted ranking method. Various issues and needs identified through data collection have been addressed in the developed concepts. The final concept incorporates a screw mechanism in the door for operating the glass window shutter both manually and with power assist. The final concept was digitally rendered by alias and keyshot.

A 1:1 working model had been made to validate the final concept and feedback was collected from users. Major users were satisfied with the product features like functionality, aesthetics, usability, safety and ergonomics. The overall user response on the final concept was positive and satisfying.



**Various concepts of power window mechanism for car**



**Working model**



**Final concept of power and manual car side window mechanism**