

Safety Innovation-Penetration Resistance Testing Machine for Safety Helmet

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Abstract: Safety helmet is one of the most important PPE used inside refinery area for protection of head against any impact from falling objects or hitting against any structure. It is therefore, important to use safety helmets designed as per Indian Standards by all workforces at refinery sites. Use of non-standard safety helmet often results in providing poor safety protection of head. Statistically, there are many accidents occurring in industries due to use of poor safety helmet. There was no testing mechanism /facilities available at industry level to test robustness of safety helmet. In search of establishing our own testing facility, Gujarat Refinery team F&S had brain storming sessions and developed one for the testing machine to test penetration resistance of a safety helmet in house. Though, Refinery standard for safety helmet is high and safety helmets procured are as per BIS and EN standard. But during course of its use, there is possibility of deterioration of its quality and most important is that a safety helmet must resist impact from a falling object as minimum.

Keywords: Safety helmet, substandard, testing mechanism, penetration, resistance, BIS, EN, impact

Brief Description of model-Safety standards for Safety Helmet

Design and development of a safety helmet penetration testing machine was done by Sri AJ Bhende, CMFS with internal resources at Gujarat Refinery in March 2018. The machine has been developed as per BIS requirements and is being used for testing of safety helmets by various working agencies in Gujarat Refinery. A plumb bob of 500 g mass with a conical steel point having an included angle of 36° and a spherical point radius of 'not more than 0.5 mm is dropped freely from a clear height of 3 Meters with the pointed end downwards on to the top of the crown of the safety helmet. If the dent is more than 0.5 mm, then safety helmet fails in the test and is rejected as it can't protect against any falling material. (Diagram and Picture of helmet testing machine attached).

BIS-2925 and EN 397 are two standards which defines material of construction and various tests for qualifying safety helmet fit for use for employees and industrial workers.

Most of the helmet manufacturing company has this equipment which costs around Rs 3.0 lakhs.

The Innovation

Using all in-house designing and fabrication, with a zeal of innovation, Gujarat refinery F&S has developed the machine as per BIS requirements and have been tested several times. It was inaugurated by our Executive Director Sh. Sudhir Kumar in eve of National Safety Day. Sincere Efforts done by Chief Manage (F&s) (Shri. Ananta Jairamji Bhende, CMFS) in designing and fabrication of the machine were appreciated by the management.

Helmet Penetration Resistance Test Machine (IS 2925) & Site pictures of testing





Pict.1: Helmet testing machine



Pict.2: Safety Helmet Testing (Before & After)

Benefits & Justification of safety helmet resistance testing machine:

This safety innovation in developing a helmet testing equipment in house saved cost. In market, it is costing approx. Rs 3.0 Lakhs. First time in any IOCL refinery, this testing equipment developed. Benefits: Regular PPE testing facility within refinery at low cost, ensuring use of fit safety helmet by users, improving safety compliance in use of tested safety helmet, confidence in use of only tested safety helmets during course of subsequent use.

Safety:

1. Identification and Replacement of low quality helmet.
2. Sense of satisfaction and positivity among workers when their low quality old helmet replaced with new high quality helmets.
3. Better PPE visibility and compliance.

Value Addition:

1. Enhancement of safety culture among the contract workers.
2. Developing behavioral change among Contractors to provide quality PPEs.

Problem Solving:

1. Easy identification of poor quality of Safety helmet.
2. Immediate replacement of helmets by contractor as there is no entry inside refinery without Safety Helmet.
3. Workers long issues of helmet quality solved.

Financial Benefits:

1. Cost Saved in terms of saving human life by using good quality of safety helmet.
2. Developed In-house at a very low cost compared to outside resulted in cost saving.

Use of Penetration Resistance Testing Machine for Safety Helmet Model:

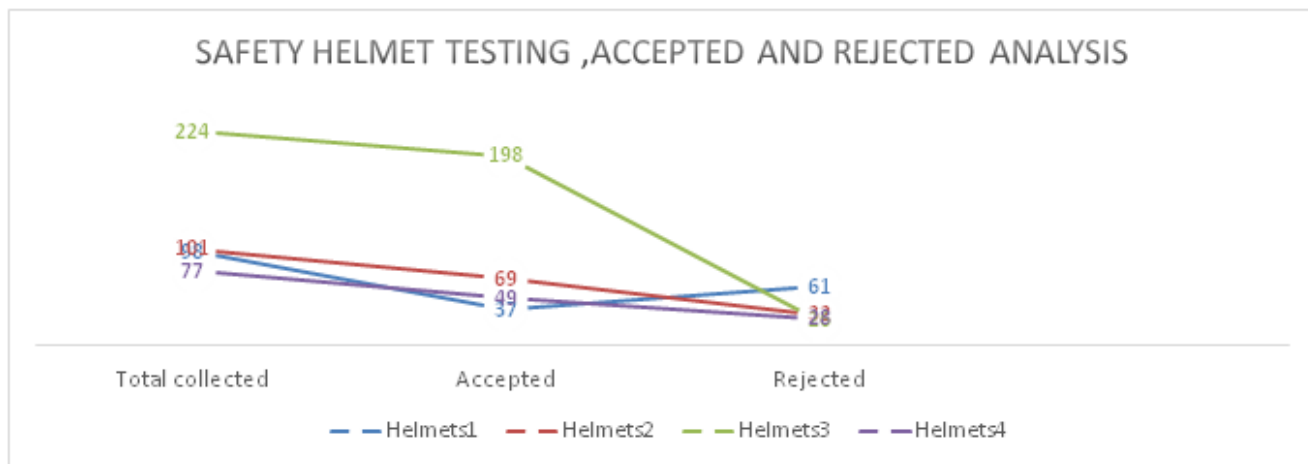
As per as industrial application is concerned standard PPE play a very crucial role, in Gujarat refinery we follow wear three and carry three concept. i.e., Safety helmet, safety shoes and Goggles to wear and three things which we have to carry along with us are ear plug, hand gloves and dust mask. All of these are essential PPE and most important body part is head and PPE we use to protect is Safety helmet. So, to check the robustness and standardize of same is very essential. We developed in house design safety helmet penetration resistance tool for helmet quality testing as per BIS-2925 & EN standard. We took survey on refinery main gate and done visuals inspection of daily basis and later on weekly basis. During visual inspection and visual checking we found that contract workers were using substandard quality of safety helmet which will not withstand heavy duty and not suitable for industrial application. As in the past statistically there are many accident occurring in industries due to use of poor safety helmet.

Raising to challenging to find innovative solutions, Gujarat refinery developed the same penetration resistance test machine at a very low cost using in-house designing and fabrication, buoyed with the zeal for innovation. The machine has been developed as per BIS requirements and have been tested several times.

To maintain and enhance safety among contract workers by preventing substandard PPE like safety helmet we have collected substandard/defective helmet and tested on our in-house design Helmet penetration machine which is

developed by Shri. Ananta J Bhende, CMFS, we are getting good result and replaced defective helmet which

are damaged during testing by “Helmet penetration testing machine”.



Statistics of testing of safety helmet of contract workers, tested accepted and found defective

	Helmets1	Helmets2	Helmets3	Helmets4
Total collected	98	101	224	77
Accepted	37	69	198	49
Rejected	61	32	26	28

References

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- [2] OISD STD-155 –Part-I Non Respiratory PPE
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