

Executive summary (not exceeding 500 words)

Today all blast vibration monitoring devices are imported from different foreign countries involving a lot of foreign currency lost to the Indian economy. Approximately about Rs. 70 crores worth of such equipment are imported to the country every year. As per Indian regulation these equipment are mandatory for use in all mines of the country on a day to day basis. The development of an indigenous instrument is not only important but also critical for the success of Indian mining. To reduce the procurement of overseas instruments using foreign currency, this aims to develop an indigenous instrument for measurement of blast-induced ground vibration for mining industry. Apart from these this project also aims to develop a software for critical analysis of the blast-vibration wave spectrum addressing the need to analyse, structural damage, human annoyance and rockmass quality degradation based on the stipulations laid down by Indian Regulatory Bodies. Further to these, it is also aimed to develop an indigenous seismograph testing and standardization system, which is neither manufactured nor available in India. However, it is mandatory for Indian mines to monitor ground vibration for each and every blast using a seismograph which is standardised in a regular interval.

This development requires a thorough knowledge of blast-induced ground vibration generation, propagation and attenuation. Suitable sensor is required with acceptable accuracy to convert the vibration into the electrical pulse. Electrical pulse as a form of output has to be stored for analysis. The total system required - an existing system for comparison; sensors; fitting arrangements, casings, memory device, hard-software interface, protection arrangements. The academic partner will be the main coordinator of the work. the complete hardware part will be developed by the academic partner. The Industry partner will be responsible for providing one existing set up, consultant fees for developing hardware-software interface and field testing of the developed system.

It is expected that on successful development of the indigenous seismograph and its standardization unit, there will be an estimated market to the tune of Rs. 70 crores every year.

Background and motivation (not exceeding 500 words)

Today all blast vibration monitoring devices are imported from different foreign countries involving a lot of foreign currency lost to the Indian economy. Approximately about Rs. 70 crores worth of such equipment are imported to the country every year. As per Indian regulation these equipment are mandatory for use in all mines of the country on a day to day basis. The development of an indigenous instrument is not only important but also critical for the success of Indian mining.

Blasting is the predominant method of rock excavation practised in Indian mines owing to its applicability over wide geo-mining conditions. The blasting involves with rapid release of energy from the explosive chemicals on its detonation. The devastating effects of energy released from explosive force the user to stay at a safe distance. This creates the problem of monitoring of the blast performance and also the progression of blasting process. performance of a blast is analyzed based on the results like fragmentation, throw, ground vibration and overbreak. However, if the performance is not at its desired level then it is difficult to trace the critical reason behind it. Generally the far-field instrumentations used for measurement of ground vibration, characterisation of explosive properties through VOD measurement etc. are commonly used for analyzing a blast performance. However, in India, none of this instruments are indigenously manufactured and thus become costly. Approximately, more than 500 seismographs are in operation in different mines. present. Because of dearth of capital a number of small agencies are unable to make the blast monitoring as a regular practice. It is expected that there is a consistent demand of more than 100 units of seismographs in the country every year and standardization requirement of 500 units every year.

Project outcomes (please list specific objectives): *The project should address a specific need of the industry/industries and there should be clear expected outcomes from the project. It is expected that joint patents will result from this project.*

- 1) Development of an indigenous blast-induced ground vibration (PPV) measuring device.
- 2) Development of a software for analysis of blast-induced ground vibration spectrum.
- 3) Development of an indigenous seismograph testing and standardization system.

Scope (not exceeding 1500 words): *The scope should clearly lay out the contributions of the academic partner and the industry partner.*

Blast performance monitoring instruments are of immense importance considering the safety of the blasting personals and the neighboring residents. Apart from the same, blasting is the main culprit of damage to the structures situated at the close proximity of the blasting zone. Director General of Mine safety wishes to make the ground vibration study mandatory for all the mines practising blasting. However, due to the costly equipment system and lack of indigenous expertness in the field of core engineering of blast induced seismicity, The indigenous seismograph is yet to be developed. This development requires a thorough knowledge of blast-induced ground vibration generation, propagation and attenuation. Suitable sensor is required with acceptable accuracy to convert the vibration into the electrical pulse. Electrical pulse as a form of output has to be stored for analysis. The total system required - an existing system for comparison; sensors; fitting arrangements, casings, memory device, hard-software interface, protection arrangements.

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