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### About the Handbook

This handbook shares author's long experience on the subject and focuses on the improvements needed in the design process with the sole objective of making practising engineers to have better perspective of the dynamics of machine foundation system.

The handbook covers basic fundamentals necessary for understanding and evaluating dynamic response of machine foundation system. It is anticipated that this handbook shall serve as a Reference Book for several industry segments like **power, petrochemical, refineries, sugar, steel, cement, textile, fertilizer, etc.**

The handbook provides basic methodology for design of foundation for **Rotary, Reciprocating & Impact Machines and also covers Vibration Isolation System.**

Four chapters of the handbook are exclusively dedicated to cover detailed design of **real life** Rotary Machines, Reciprocating Machines (both Block and Frame foundations), Impact Machines as well as design of Vibration Isolation system.

In addition a chapter has been exclusively provided to cover case studies and feedback.

**The author is confident that it shall bridge the knowledge gap and shall be beneficial to practising engineers, students, academicians, researchers as well to the industry in general.**

**Global Sales (1<sup>st</sup> edition – about 30 countries):** India, USA, Uruguay, Canada, Italy, Australia, Turkey, Russia, Japan, Singapore, Nigeria, UK, Bulgaria, Hungary, Pakistan, Oman, Spain, Sudan, Thailand, Brazil, Peru, Taiwan, UAE, Mexico, South Korea, Argentina, Ireland, Saudi Arabia,.....

### Highlights of the 2<sup>nd</sup> Edition

This 2nd edition is based on the feedback from the practising Engineers during various training programs conducted by the author.

The additions and modifications made in the 2nd edition are broadly as under:

- A chapter has been added on Foundation design for R & M Projects. Design guidelines for upgrading existing foundations have been addressed.
- Additional machine and foundation parameters, which significantly influence machine response, have been included.
- Many more detailed design examples of real life machines have been added for the benefit of the practising engineers
- While using standard structural analysis packages for machine foundation designs, difficulties experienced by designers have been duly addressed in modeling and analysis chapter .
- Handbook has been made more user friendly by removing Mathematical Derivations from analytical chapters and appending the same at the end of the book as Appendix

It is anticipated that this 2nd edition shall bridge the knowledge gaps and shall place practising engineers in a comfortable position with regard to designs of machine foundations.



### About the Author

**Dr. K. G. Bhatia**, after obtaining Bachelors Degree in Civil Engineering from BHU, (presently Institute of Technology, BHU, India), completed Masters in Structural Dynamics with specialization in Earthquake Engineering from University of Roorkee (presently Indian Institute of Technology, Roorkee) and thereafter joined International Institute of Seismology & Earthquake Engineering (IISEE), Tokyo, Japan under UNESCO for advanced research. The research work was further extended for award of PhD from **Indian Institute of Technology, Delhi**.

He switched over to industry in 1971 and after serving **Engineers India Ltd (EIL)**, a pioneering Consultancy Organization, he moved to power giant **Bharat Heavy Electricals Limited (BHEL)** where he was Head of Structural Dynamics for many years. He has about three decades of rich experience in design, testing and failure analysis of **Machine Foundations, Seismic Qualification of Power Plant Equipment** as well as **Stress & Vibration Analysis of Structures and Equipment**.

He has been engaged in design, testing and review of machine foundations for various industrial projects viz. Petrochemicals, Refineries, Power plants etc. for over three decades. He has been associated with **Failure Analysis Studies** on various types of machines for over two decades and has conducted extensive tests on machine foundation models as well as on prototypes.

**In the 2<sup>nd</sup> edition, the text is divided in to 6 parts.**

#### **Part I takes care of Theoretical Aspects**

An overview providing basic familiarization with the subject is covered in **Chapter 1**.

Necessary understanding of Theory of Vibration with specific application to machine foundation design is included in **Chapter 2** and **Chapter 3**. **Chapter 4 caters to** Basic Theory of Vibration Isolation.

#### **Part II caters to Design Parameters**

**Chapter 5** provides reasonable coverage to **Soil Dynamics** and evaluation of Design Soil Parameters as applied to Machine Foundation Design.

Desired emphasis has been given to Design Machine Parameters. Translation of **Machine Data to Design Data** is given in **Chapter 6**.

**Chapter 7** is attributed to **Design Foundation Parameters**. It covers all those aspects related to foundation that play vital role in computing Dynamic Response.

#### **Part III deals with design of Foundations for Real Life Machines.**

**Chapter 8** is devoted to Modeling and analysis including Finite Element Analysis. All possible aspects of modeling related to design of foundation have adequately been covered.

**Chapter 9, 10 & 11** cover **Design of Foundation for real life Machines. Block Foundations** are addressed in **Chapter 9**; **Frame Foundations** in **Chapter 10** and **Foundations for Impact Type Machines** are addressed in **Chapter 11**.

#### **Part IV caters to Design of Foundations with Vibration Isolation System**

A good amount of emphasis is given to Vibration Isolation of the Foundations. Design of **Foundations with Isolation Devices** is covered in **Chapter 12**.

#### **Part V caters to Foundations for R & M Projects**

Unlike new projects, R & M projects pose many limitations to the designers. Reasonable coverage is provided to cater to the situations of installing new machines on existing foundations, use of Vibration Isolation for the design of foundations etc. A few **real life designs of foundations** are covered in **Chapter 13**.

**Part VI caters to Construction Aspects and Case Studies** related to machine foundation. **Construction Aspects** are covered in **Chapter 14** and **Case studies and observations** are given in **Chapter 15**