

Engineering Science And Application Design For BELT CONVEYORS

By

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The compliments on book (manuscript); from world renown personalities in the field of bulk material handling.

□ “ We have seen this book and found to be interesting and useful for design engineers, application engineers and users of belt conveyors and bulk material handling plants. The book provides comprehensive information on design as well as application engineering for wide-ranging practical needs. We wish all the success for the book *Engineering Science And Application Design for Belt Conveyors* - **Dr.- Ing. R.H.Wohlbiel Germany.** □

□ “ We have seen this book. Our impression is that the book is an excellent source of information in all aspects of belt conveyor technology. We are pleasantly surprised at the amount of details included in the book and already see that it will become a standard reference within the office.

We have specialization in designing and building long, high capacity overland conveyors and the rationale behind some of our decisions in designing such systems has been difficult to find in print, at least until now. The author has managed to include a lot of information that can only be gathered by years of practical experience. We appreciate the author’s efforts and wish great success with this publication.

- **Steve Harrington, P. Eng., Vice President Krupp Canada.** □

□ “ I have read this book on belt conveyors, and really am most impressed by how the author has tackled a most challenging subject. The author’s knowledge gleaned from many years in industry shines through. It is particularly pleasing to see the derivation of formulae that have been used for a long time. I am sure that this book will become acknowledged as another industry standard alongside the trusted guides the CEMA handbook – Belt conveyors for bulk materials; and UK’ standard publication, the MHEA – Recommended practice for troughed belt conveyors.

- **Alan Jackson. Committee Member, BSI British Standards Organisation**

Committee Member, IMechE - Institute of mechanical Engineers, U. K. Bulk Material Handling Group.

Vice President and Chairman of technical committee MHEA UK (Material handling engineer’s association U. K.)

Member - Ports U. K. group.” □

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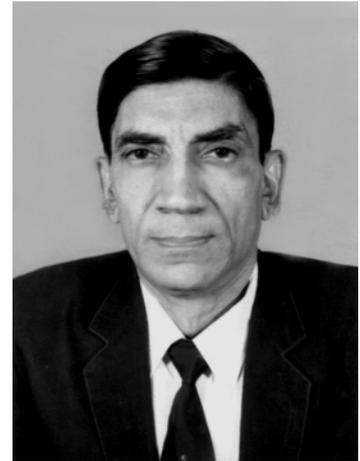
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PREFACE

This book deals with the fundamentals of belt conveyor design for handling of bulk materials. Any belt conveyor design mainly concerns with the calculation of capacity, belt width, belt speed, drive power and belt tensions. These parameters have profound effect on overall design, construction and ultimately the cost of conveyor as a whole. Therefore, the right design for these parameters is of paramount importance.



Various methods and formulae are already in use for conveyor design. Much of the published information is seen all around; sometimes mismatching with each other and often without availability of supporting derivation for designer. The designer can only make the right design if he has complete clarity on the theoretical background for the formula being used.

In view of above, this book aims at derivation / publication of various formulae and norms from first principles of engineering-science for in-depth perception of the subject matter to the designer. This provides complete information to the designer and automatically clarifies the basic guidelines and limitation if any, for the particular design approach being followed.

As the engineering analysis and derivations are based on basic rules; the book is likely to have long time utility. The dynamics of belt conveyor mainly concerns with motion and forces, and hence same are on the basis of very well known Newton's law of motion. The author has tried to give new dimension to the subject matter by applying analytical engineering approach to various practices being followed for rationalization of data and thorough understanding for **the readers at large**.

Although the book has necessary theoretical background, but it is written for the purpose of direct use for application-design for contractual requirements. This is a 'decision making' book for design and implementation purpose. Having done all the analysis of a particular topic, specific and clear-cut opinion / suggestions are incorporated to assist the designer / user for his quick / correct decision, to suit contract needs.

For such book to be of practical value, it needs to conform to commercially acceptable standard and norms. The book design-approach primarily relies on ISO-5048, DIN-22101 and latest practices / norms being followed in this field all over the world. The readers, who are used to other standards in Europe or USA practice will also find this book very useful to get new insight into the subject and to comply to the respective standards in a more exact / easy manner. This is due to the fact that although calculation style could be different, the underlying considerations and principles are same.

Preface

The book is written in S.I units. However, clear notes are given at the end of certain chapters to use the same in FPS units, which are presently prevailing in USA for belt conveyor technology. It is clarified that for FPS units, the force unit of poundal is used which is synonymous to Newton in S.I. units. This makes the transformation from S.I. system to FPS system quite simple, i.e. it does not need any change in S.I. formula. Only FPS units are to be used in S.I. formula and the derived result is in poundals. This eliminates the vexing confusion whether to apply multiplier 'g' in numerator or denominator during conversion between S.I. system and FPS system. Needless to mention 32.2 poundals are equal to 1 pound-force. Thus, all the S.I. formulae related to force-motion are valid when units are mass in Lb., dimension in Foot, time in second and force in poundal; instead of Kg, Metre, Second and Newton respectively. This is applicable to all the formulae, which are derived on the basis of general rules of science, and which are not unit specific empirical formulae.

As stated earlier, main subject of the book is to find out belt conveyor important parameters such as capacity, belt width, belt speed, drive power and belt tensions. However, one cannot decide any one of these parameters without proper knowledge of complete conveyor. Therefore, the book contains design related necessary information about various components of conveyor. More information is given on conveyor specific components, compared to general mechanical components such as gearbox etc.

The belt conveyor rarely works in isolation. It is required to function in conjunction with directly associated other equipment and structures. Therefore the book provides conveyor related information about such equipment / structures. For example, the super structure for conveyors is a job for structural engineer, however its dimensioning and arrangement is practically fixed by conveyor designer. Hence, this book includes pertaining information about such items where certain decisions are expected from conveyor designer.

The book is written to facilitate its use by mechanical engineer with usual qualification, who may be familiar or not familiar to the subject. Therefore, various topics begin with this background of knowledge. The book practically does not contain self-proclaimed assertions. It goes by engineering principles and universally accepted practices; and **creates its own reliability by transparency.**

In this book, more stress is towards engineering approach and methods, which can be adopted for solution. There could be different view about the value of input data, i.e. whether to consider value of safety factor equal to 2.25 or 2.50 for particular case. The designer may adopt such values as per numerous considerations (contractual requirement / standards being followed / level of safety / reliability of available materials etc.).

All the care has been taken in this book to provide impartial presentation on the subject matter. The book tries to make designer's work easy. However, bulk materials and application situations are highly varied in nature, and therefore, element of engineering judgement can not be eliminated altogether in solution to engineering problems. The designer should decide the right solution befitting to the specific

Preface

need with open mind and approach. As is the usual practice for such publications, the book and the author are not party to the decision so made.

The author felt necessity to write this book considering the difficulty faced by engineers concerned with this subject, longer induction period, conflicting stands in contract implementation and therefore the need for rationalisation of published information. It appears that the engineering practices / tradition for this subject have multi-center evolution with too much time lag between cross-effect and willingness to change towards common style. This is some what comparable to varied practices / standards in metallurgy which was not even recognised for scientific consideration till very late stage of industrialisation, in spite of its very long time association with the human survival! The writing of this book; on not so streamlined application engineering subject, is a difficult / hazardous task due to mismatching data / practices. This makes the writing and recommendation process much more complex than anticipated; and one is likely to end the efforts before completion of work. This is particularly true for people in industrial profession. I am thankful to **Dr.-Ing. R.H. Wöhlbier** of Germany for his encouragement to me in this matter, which has really helped for successful completion of this book during long time to prepare the book. I am also thankful to **Mr. Steve Harrington** of Canada and **Mr. Alan Jackson** of U. K. for devoting their efforts and valuable time to study and opine on this book.

I am thankful to mechanical engineers Mr. G.M. Parmar, Mr. Jagdeep, Mr. Parikshit and Mr. Uday Singh for devoting their time and efforts in preparation of certain data and for conversion of the manuscript in to electronic form. I also express sincere thanks to all the friends who have finally helped in publication of this book.

The book is dedicated to all the people who have contributed for the development in this field during course of time; and to human beings' eternal pursuit for rationality and knowledge.

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