

**IV. STUDY ON PULSATION ACCORDING TO API 618 ANALYTICAL METHOD**

According Design Approach 2 of API Standard 618 8<sup>th</sup> edition 2007, an acoustic simulation is required to evaluate and control pulsation in piping systems of reciprocating compressors. The pulsation report contains a summary of the pressure pulsations in the piping system as well as modifications proposed to reduce pulsation to the agreed level. The original system layout will be checked with respect to pulsation. All operating cases that are characterized by steady-state operating conditions will be checked, thus transient cases (e.g. start-up-cases) are excluded. Different gas properties and operation cases are considered. Valve unloading cases are considered as operation cases. Measures are proposed to reduce pressure pulsations, e.g. installation of orifices, changes in piping length or diameter. Shaking trays are used in the subsequent vibration study.

**Input Data for Pulsation Study**

The exact gas data means gas composition and gas properties like velocity of sound, density, pressure, temperature flow for which compressor is going to use is considered for the pulsation simulation. Also the isometric drawings of piping and compressors are used for the pulsation simulation.

Table : 4.1 — Gas Properties / Input Data for Pulsation Simulation

Case	Type	Temperature		Pressure		Density		Velocity of Sound	
		inlet	outlet	inlet	outlet	inlet	outlet	inlet	outlet
1	Normal	300	300	10.0	10.0	1.2	1.2	340	340
2	Hot	350	350	10.0	10.0	1.2	1.2	340	340
3	Normal +1	300	300	10.0	10.0	1.2	1.2	340	340
4	Hot	350	350	10.0	10.0	1.2	1.2	340	340
5	Hot +1	350	350	10.0	10.0	1.2	1.2	340	340

**Calculation and Interpretation of Analytical Results**

The study of the gas pulsation is carried out with the digital simulation program PULSIM which has been developed by the TRITOPTE Institute in Gdansk (PL). A system of pipes is built of several complicated parts and elements which must be simplified for calculations. For example volume of a cylinder casing between valves and connecting flange, heat exchangers, separators, dampers, etc. The data of the gas might also change during operation. In order to take these uncertainties into account, we make several calculations at different velocities of sound. The range of variation is ± 1.2 % and it is varied in steps of 2%. The results are presented in tables.

**Admissibility limits**

The main requirements of API 618 are as follows:  
 [API 618, section 7.6.4.2.5.2.2.2] "For systems operating at absolute line pressures between 3.5 bar and 350 bar (0.50-5.000 MPa), the peak-to-peak pulsation level of each individual pulsation component shall be limited to that calculated by (eq. 6) using:"

# Api 618 5th Edition

**D Keegan**



## **Api 618 5th Edition:**

Operator's Guide to Process Compressors Robert X. Perez, 2019-04-16 The perfect primer for anyone responsible for operating or maintaining process gas compressors Gas compressors tend to be the largest most costly and most critical machines employed in chemical and gas transfer processes Since they tend to have the greatest effect on the reliability of processes they power compressors typically receive the most scrutiny of all the machinery among the general population of processing equipment To prevent unwanted compressor failures from occurring operators must be taught how their equipment should operate and how each installation is different from one another The ultimate purpose of this book is to teach those who work in process settings more about gas compressors so they can start up and operate them correctly and monitor their condition with more confidence Some may regard compressor technology as too broad and complex a topic for operating personnel to fully understand but the author has distilled this vast body of knowledge into some key easy to understand lessons for the reader to study at his or her own pace This groundbreaking new work is a must have for any engineer operator or manager working with process compressors The main goals of this book are to Explain important theories and concepts about gases and compression processes with a minimum of mathematics Identify key compressor components and explain how they affect reliability Explain how centrifugal compressors reciprocating compressors and screw compressors function Explain key operating factors that affect reliability Introduce the reader to basic troubleshooting methodologies Introduce operators to proven field inspection techniques Improve the confidence of personnel operating compressors by teaching them the basics of compressor theory Improve compressor reliability plantwide by teaching operating and inspection best practices Improve communication between operating and supporting plant personnel by providing a common vocabulary of compressor terms Help processing plants avoid costly failures by teaching operators how to identify early compressor issues during field inspections

**The Language of Machines: Everything About Vibration Analysis** Fahri YILMAZ, This book is designed as a comprehensive resource for both engineers with field experience and interested engineering students While it covers advanced engineering topics no unfamiliar concepts are left unexplained The goal is to provide in depth technical information on vibration analysis while simultaneously providing a clear and fluent language that allows the reader to grasp the fundamentals of the subject From an engineer's perspective it may not always be possible to search for new literature or gather information from scattered sources in the daily routine of work this book will fill an important gap by combining all the necessary concepts and modern approaches to vibration analysis in one resource For engineering students the book aims to lay a solid academic foundation while demonstrating the real world application of theory through industrial application examples This will allow students to better understand how the theoretical knowledge they learn applies in practice The book encompasses technical topics that extend to graduate level but the language is carefully designed to make complex mathematical expressions and engineering terminology understandable

Each chapter defines critical terms and concepts are supported with visuals and examples when necessary Throughout the book real world industrial case studies are included aiming to provide readers with not only theoretical knowledge but also practical experience Examples include how a generator failure at a power plant was diagnosed step by step by analyzing vibration data or how a maintenance plan was developed by analyzing vibration trends at a petrochemical plant Another important contribution of this book is its systematic compilation of current information scattered throughout the literature Vibration analysis and condition monitoring technologies are rapidly evolving in particular digital transformation the IIoT Industrial Internet of Things and machine learning based analysis methods are becoming increasingly integrated into industry The book will provide the reader with a perspective on future applications by addressing these new generation approaches as well as classical vibration analysis methods Designed with a balance between academic integrity and industrial practice the content is suitable for use both as a university textbook and as a reference guide for field engineers Furthermore summary points and references at the end of each chapter will direct readers to resources for more in depth research on topics of interest In conclusion Vibration Analysis This book on the subject will be a comprehensive guide from theory to practice for engineers and engineering students Upon completion the reader will understand how to interpret vibration data identify different types of failures from vibration patterns and implement an effective vibration based maintenance program in their own facility The subsequent chapters of the book advance these objectives

**Proceedings of First International Conference on Emerging Trends in Mechanical Engineering**, *Condition Monitoring, Troubleshooting and Reliability in Rotating Machinery* Robert X. Perez, 2023-05-03 ROTATING MACHINERY This third volume in a broad collection of current rotating machinery topics written by industry experts is a must have for rotating equipment engineers maintenance personnel students and anyone else wanting to stay abreast with current rotating machinery concepts and technology Rotating Machinery Fundamentals and Advances represents a broad category of equipment which includes pumps compressors fans gas turbines electric motors internal combustion engines etc that are critical to the efficient operation of process facilities around the world These machines must be designed to move gases and liquids safely reliably and in an environmentally friendly manner To fully understand rotating machinery owners must be familiar with their associated technologies such as machine design lubrication fluid dynamics thermodynamics rotordynamics vibration analysis condition monitoring maintenance practices reliability theory and others The goal of the Advances in Rotating Machinery book series is to provide industry practitioners a time saving means of learning about the most up to date rotating machinery ideas and best practices This three book series covers industry relevant topics such as design assessments modeling reliability improvements maintenance methods and best practices reliability audits data collection data analysis condition monitoring and more Readers will find a good mix of theory and sage experience throughout this book series Whether for the veteran engineer a new hire technician or other industry professional this is a must have for any

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