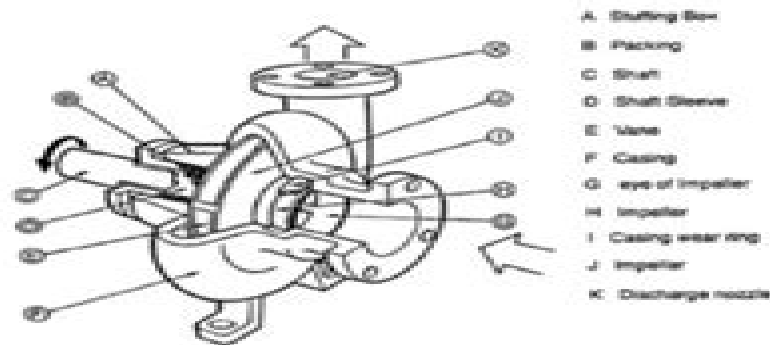


CENTRIFUGAL PUMP

DESIGN CALCULATION



The design pump is single stage centrifugal pump. Impeller is designed on the basis of design flow rate, pump head and pump specific speed.

Specific speed is used to classify impeller on the basis of their performance, and proportions regardless of their actual size or the speed at which they operate.

Specific speed; $n_s = 3.65N\sqrt{Q}/H^{3/4}$

Where, n_s = specific speed
 Q = flow rate
 N = rotational speed
 H = head

Capacity; $Q = AV$

Where, A = area of pipe
 V = volume flow rate

WATER POWER AND SHAFT POWER

$N = \rho g H Q$

Where, ρ = density of water
 g = gravitational acceleration

Shaft power = waterpower/ η_o

VELOCITY DIAGRAM

The blade velocity at inlet is;

$U_1 = \pi D_1 N / 60$

Where, U_1 = blade velocity
 N = rotational speed

Pump efficiency is

$\eta_o = \eta_m \times \eta_v \times \eta_r$

Where, η_m = mechanical efficiency
 η_v = hydraulic efficiency
 η_r = volumetric efficiency

The inlet area of a impeller is

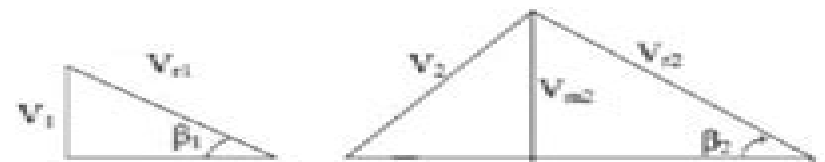
$A_1 = \pi/4(D_1^2)$

Where, D_1 = inlet impeller diameter

The outlet area of a impeller is

$A_2 = \pi D_2 b_2$

Where, D_2 = outlet impeller diameter
 b_2 = impeller width at outlet



Pump Design Guide

Charles Nehme



Pump Design Guide:

Centrifugal Pumps Val S. Lobanoff, Robert R. Ross, 2013-10-22 Centrifugal Pumps Design and Application Second Edition focuses on the design of chemical pumps composite materials manufacturing techniques employed in nonmetallic pump applications mechanical seals and hydraulic design The publication first offers information on the elements of pump design specific speed and modeling laws and impeller design Discussions focus on shape of head capacity curve pump speed viscosity specific gravity correction for impeller trim model law and design suggestions The book then takes a look at general pump design volute design and design of multi stage casing The manuscript examines double suction pumps and side suction design net positive suction head and vertical pumps Topics include configurations design features pump vibration effect of viscosity suction piping high speed pumps and side suction and suction nozzle layout The publication also ponders on high speed pumps double case pumps hydraulic power recovery turbines and shaft design and axial thrust The book is a valuable source of data for pump designers students and rotating equipment engineers , *Pump Characteristics and Applications, Third Edition* Michael Volk, 2013-10-21 Providing a wealth of information on pumps and pump systems Pump Characteristics and Applications Third Edition details how pump equipment is selected sized operated maintained and repaired The book identifies the key components of pumps and pump accessories introduces the basics of pump and system hydraulics as well as more advanced hydraulic topics and details various pump types as well as special materials on seals motors variable frequency drives and other pump related subjects It uses example problems throughout the text reinforcing the practical application of the formulae and analytical presentations It also includes new images highlighting the latest generation of pumps and other components explores troubleshooting options and incorporates relevant additions into the existing chapters What's New in This Edition Includes more than 150 full color images which significantly improve the reader's ability to understand pump drawings and curves Introduces a new chapter on pump case studies in a format that provides case study background analysis solutions and lessons learned Presents important new updates and additions to other chapters Includes a ten step procedure for determining total pump head Discusses allowable and preferred operating ranges for centrifugal pumps Provides charts covering maximum and normally attainable pump efficiencies performance corrections for slurry pumps and mechanical seal flush plans Pump Characteristics and Applications Third Edition is appropriate for readers with all levels of technical experience including engineering and pump industry professionals pump operators and maintenance technicians upper level undergraduate and graduate students in mechanical engineering and students in engineering technology programs **Pump Characteristics and Applications, Second Edition** Michael Volk, 2005-04-07 This hands on reference offers a practical introduction to pumps and provides the tools necessary to select size operate and maintain pumps properly It highlights the interrelatedness of pump engineering from system and piping design to installation and startup This updated second edition expands on many subjects introduced in the first edition and also provides new in

depth discussion of pump couplings o rings motors variable frequency drives pump life cycle cost corrosion and pump minimum flow Written by an acclaimed expert in the field *Pump Characteristics and Applications Second Edition* is an invaluable day to day reference for mechanical civil chemical industrial design plant project and systems engineers engineering supervisors maintenance technicians and plant operators It is also an excellent text for upper level undergraduate and graduate students in departments of mechanical engineering mechanical engineering technology or engineering technology About the Author Michael W Volk P E is President of Volk pump equipment evaluation troubleshooting and field testing expert witness for pump litigation witnessing of pump shop tests pump market research and acquisition and divestiture consultation and brokerage A member of the American Society of Mechanical Engineers ASME and a registered professional engineer Volk received the B S degree 1973 in mechanical engineering from the University of Illinois Urbana and the M S degree 1976 in mechanical engineering and the M S degree 1980 in management science from the University of Southern California Los Angeles

Hydronic Pump Installation: A Comprehensive Guide Charles Nehme, In the complex and ever evolving world of modern HVAC and MEP systems the role of a properly installed and commissioned pump cannot be overstated These unsung heroes are the very heart of hydronic systems tirelessly circulating chilled water for cooling hot water for heating and condenser water for heat rejection Without their precise function a building s climate control energy efficiency and operational integrity are compromised This book is born from over three decades of hands on international experience in the field It is designed to be more than just a theoretical text it is a practical guide that distills the essential knowledge and step by step procedures required to ensure a successful and reliable pump installation From foundational planning and site preparation to the nuances of precision alignment and final commissioning this guide aims to empower professionals with the insights needed to avoid common pitfalls ensure system longevity and contribute to the creation of high performing sustainable built environments

Pump User's Handbook Heinz P. Bloch, Allan R. Budris, 2021-01-07 This text explains just how and why the best of class pump users are consistently achieving superior run lengths low maintenance expenditures and unexcelled safety and reliability Written by practicing engineers whose working career was marked by involvement in pump specification installation reliability assessment component upgrading maintenance cost reduction operation troubleshooting and all conceivable facets of pumping technology this text describes in detail how to accomplish best of class performance and low life cycle cost

Geothermal Heat Pumps: Installation Guide Stephen K. Ewings, 2008-10

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Regulatory Guide U.S. Nuclear Regulatory Commission. Office of Standards Development, 1978 Contents 1 Power reactors 2 Research and test reactors 3 Fuels and materials facilities 4 Environmental and siting 5 Materials and plant protection 6 Products 7 Transportation 8 Occupational health 9 Antitrust reviews 10 General

Process Engineering Data Book Nicholas P. Cheremisinoff, Louise Ferrante, 1995-12-22 This is a convenient one volume reference that provides process engineers with quick information on the major equipment processes and materials used in chemical food water wastewater fuel and other types of process engineering The data is presented in short articles supplemented and illustrated by tables diagrams charts and formulas The data is organized in twenty short chapters with a detailed index for easy reference Much of the data is economically presented in tables

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