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A moderate knowledge of physics is assumed. Controls and regulators for ideal temperature, pressure and flow control; steam traps for efficient drainage of condensate for maximum heat transfer; flowmeters for precise measurement of liquids; liquid drain traps for automatic and continuous drain trap operation to boost system efficiency; rotary filters for increased productivity through proper filtering of fluids; condensate recovery pumps for effective condensate management to save water and sewage costs; stainless steel specialty products for maintaining quality and purity of steam; and a full range of pipeline auxiliaries, all work together to produce a productive steam system. 4 Spirax Sarco's new line of engineered equipment reduces installation costs with prefabricated assemblies and fabricated modules for system integrity and turnkey advantages. (Fig 1) The Formation of steam steam is created from the boiling of water. It's little surprise that our industry-leading solutions are built on the widest product portfolio, catering for just about every aspect of steam and fluid processing infrastructure. 6 Basic Steam Engineering Principals Introduction This Spirax Sarco Steam Utilization Course is intended to cover the basic fundamentals and efficient usage of steam. . Tags: Engineering, Spirax sarco, Spirax, Sarco, Published, Steam, Published by, Steam engineering, Spirax sarco steam Information 1 2 Published by \$ per copy Copyright 2017 by Spirax Sarco, Rights Reserved No part of this publication may be reproduced, stored in a retrieval system or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of the the on-going need for education as it relates to the fundamentals of steam including the most efficient use of its heat content. Spirax Sarco has developed the steam Utilization Course. From initial consultation to effective solutions, our goal is to manufacture safe, reliable products that improve productivity. Spirax Sarco draws upon its worldwide resources of over 4000 people to bring complete and thorough service to steam users. 3 This service is built into our products as a performance guarantee. When water reaches its saturation point, it begins to change from a liquid to a gas. Complete the form below to download the digital version of the Spirax Sarco USA Product Handbook the complete product line. Heat energy from the burner will be transferred through the pan into the water, causing the water's temperature to rise. (Fig 1 & 2) Latent Heat (h_{fg}) The enthalpy of evaporation. Eventually, the water temperature will rise to its boiling point (saturation temperature) at atmospheric pressure, which is 212 F at sea level. Related search queries Specifically, it is the amount of heat energy necessary to raise one pound of water one degree Fahrenheit on a definite scale. As each degree of temperature rise is registered on the thermometer, we can read that as the addition of 1 BTU. We will focus largely on liquid and gas phases and the changes that occur during the transition between these two phases. 8 steam is the vaporized state of water which contains heat energy intended for transfer into a variety of processes from air heating to vaporizing liquids in the refining process. This course has been designed and written for those engaged in the design, operation, maintenance and or general care of a steam system. For assistance with the installation or operation of any Spirax Sarco product or application, call toll free: 1-800-883-4411 4 Contents 4 BASIC steam engineering PRINCIPLES 6 INTRODUCTION 6 WHAT IS steam 6 DEFINITIONS 6 THE FORMATION OF steam 6 steam Saturation Table 8 steam GENERATION 10 BOILERS & BOILER EFFICIENCY 10 SELECTION OF WORKING PRESSURES 11 steam Velocity 12 Air and Non-Condensable Gases 13 steam SYSTEM BASICS 14 steam PIPING DESIGN CONSIDERATIONS 15 steam AND CONDENSATE METERING 17 WHY MEASURE steam 18 Plant Efficiency 18 Energy Efficiency 18 Process Control 18 Costing and Custody Transfer 18 CONTROL AND REGULATION OF steam 19 PRESSURE REDUCING VALVES 19 Direct Acting Valves 19 Pilot Operated Valves 20 Selection and Application 21 TEMPERATURE CONTROL VALVES 22 Manual Controls 22 Self-Acting Controls 22 Pilot Operated Controls 23 Pneumatic Controls 24 Proportional Control Bands 24 steam TRAPS AND THE REMOVAL OF CONDENSATE 26 CONDENSATE REMOVAL 26 Air Venting 27 Thermal Efficiency 27 Reliability 275 steam TRAPS 27 Mechanical steam Traps 28 Thermostatically or Temperature Controlled Traps 30 Thermodynamic steam Traps 32 Variations on steam Traps 33 Swivel Connector Traps 37 steam TRAP TESTING METHODS 37 Visual Testing 37 Ultrasonic Trap Testing 37 Temperature Testing 38 Conductivity Testing 38 Wireless steam Trap Monitoring 39 BY-PASSES AROUND steam TRAPS 40 PREVENTIVE MAINTENANCE PROGRAMS 40 steam Trap Fault Finding 40 steam Trap Discharge Characteristics 42 steam TRAP SELECTION 426 Waterlogging 42 Lifting of Condensate 43 REQUIREMENTS FOR steam TRAP/APPLICATIONS 43 Application Requirements 43 steam Trap Selection Chart 44 steam Trap Sizing 45 steam TRACING 46 CRITICAL TRACING 46 NON-CRITICAL TRACING 46 Attaching Tracer Lines 47 JACKETED PIPE TRACERS 48 steam TRACING MANIFOLDS 49 CONDENSATE MANIFOLDS 49 CONDENSATE MANAGEMENT 51 FLASH steam RECOVERY 52 CONDENSATE RECOVERY SYSTEMS 56 Electrically Driven Pumps 58 Non Electric Pressure Powered Pumps 59 WATERHAMMER IN CONDENSATE RETURN LINES 61 steam UTILIZATION COURSE REVIEW 63 Contents 56 Basic steam engineering Principals 6 Introduction This Spirax Sarco steam Utilization Course is intended to cover the basic fundamentals and 7 Efficient usage of steam as a cost effective conveyor of energy (Fig. The heat input which produces a change of water from liquid to Heat Is the sum of sensible heat and latent heat (h_t=h_f+h_{fg}). For all practical purposes a measurement from a known starting point to a known ending Energy Saturation The point where a substance can hold no more energy without changing phase (physical state). Enthalpy The term given for the total energy, measured in BTU's, due to both pressure and temperature of a fluid or vapor, at any given time or Pressure (PSIG) Pressure shown on a standard gauge and indicated the pressure above atmospheric Pressure (PSIA) The pressure from and above perfect vacuum Sensible Heat (h_f) The heat energy that raises the water temperature from 32 F. 9 The maximum amount of sensible heat the water can absorb is determined by the pressure of the liquid. Beginning with steam generation, through distribution and utilization and ultimately returning condensate to the boiler, Spirax Sarco has the solutions to optimize steam system performance and increase productivity to save valuable time and today's economy, corporations are looking for reliable products and services to expedite processes and alleviate workers of problems which may arise with their steam systems. The steam Utilization Course can be used in conjunction with Design of Fluid Systems Hook Ups for a complete and concise knowledge of the use of steam for Sarco, Northpoint, SC Sarco Spirax Sarco is the recognized industry standard for knowledge and products and for over 100 years has been committed to servicing the steam users worldwide. The first part of this course attempts to define the basic terminology and principles involved in steam generation and system Is steam Like many other substances, water can exist in the form of either a solid, liquid, or gas. With a quick, responsive team of sales engineers and a dedicated network of local authorized distributors Spirax Sarco provides quality service and support with fast, efficient steam system components are at the heart of Spirax Sarco's commitment. The use of steam for power generation is a specialized subject, already well documented, and is outside the scope of this course. We can actually monitor the heat energy transfer () by watching the thermometer level rise - one BTU of heat energy will raise one pound of water by one degree Fahrenheit. Let's investigate how this happens by placing a thermometer in one pound of water at a temperature of 32 F, which is the coldest temperature water can exist at atmospheric pressure before changing from liquid to a solid. 10 Let's put this water into a pan on top of our stove and turn on the burner. As support to industries around the globe, Spirax Sarco offers decades of experience, knowledge, and expert advice to steam users world-wide on the proper control and conditioning of steam systems. With such an extensive range available, we can provide the right equipment for your needs. What's more, you get products that are not only highly innovative, but work together seamlessly to best fit your needs with the lowest operational costs. Our commitment to the highest product quality also means we can confidently offer industry-leading warranties as standard, including a lifetime material warranty on selected products, as well as the option of extended warranties. You will benefit from a steam system that performs day-in, day-out at the highest levels of efficiency and productivity, supported by readily available spares and straightforward servicing. 2) to space heating or process heating equipment. As heat energy (BTU's) is added to water, the temperature rises accordingly. Perhaps the first thing that we should do is define some of the basic terminology that will be used in this The basic unit of measurement for all types of heat energy is the British Thermal Unit or BTU. This handbook represents over 100 years of steam experience in the proper selection, sizing and application of steam traps, pressure and temperature controls, and condensate recovery systems in major industrial plants throughout the world. The steam Utilization Course can be used in conjunction with Design of Fluid Systems Hook Ups for a complete and concise knowledge of the use of steam for Sarco, Northpoint, SC Sarco Spirax Sarco is the recognized industry standard for knowledge and products and for over 100 years has been committed to servicing the steam users worldwide. 2 The existing and potential applications for steam, water and air are virtually unlimited. From large oil refineries and chemical plants to local laundries, from horticulture to shipping, for hospitals, universities, offices and hotels, in business and government, wherever steam, hot water and compressed air is generated and handled effectively and efficiently, Spirax Sarco is there with knowledge and experience. 2 Published by \$ per copy Copyright 2017 by Spirax Sarco, Rights Reserved No part of this publication may be reproduced, stored in a retrieval system or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of the the on-going need for education as it relates to the fundamentals of steam including the most efficient use of its heat content. Spirax Sarco has developed the steam Utilization Course. Any additional heat energy that we add at this point will cause the water to begin changing state (phase) from a liquid to a gas (steam).

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