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Chapter 1 : Practical Industrial Furnace Design - Matthew Holmes Mawhinney - Google Books

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Our company is located in Oak Ridge, Tennessee and we offer complete turn-key solutions to a wide variety of thermal processing needs. During the few months sans cold and snow most here and in neighboring states relish the use of fans and air conditioners as opposed to the near continuous operation of household furnaces needed in the winter. While this period of heater dormancy is welcomed by many consumers, furnaces continue to play an important role in day to day life, finding use in a number of industrial applications throughout the year. These uses require not household appliances, The design of the heat treat furnace features a flow through configuration that allows green product to be loaded on one side and treated materials to be unloaded on the opposite side of the furnace. The flow through design provides the Read More businessIndustry Information Industrial Furnaces Industrial furnaces are enclosed structures that contain high heat chambers. Compared to industrial ovens, they provide much higher temperatures and therefore are mostly used on materials with high melting points. They are found in glass fabrication, steel service centers, foundries, forgeries, metal recycling plants and any metallurgy application involving the use of heat to alter, improve, fabricate or form metals like steel, titanium and aluminum, alloys, glass, composite materials and some plastics. Furnaces meant for small runs are usually of single chamber design and are manually loaded and unloaded with various tools to lift crucibles full of molten metal or heat treated products. Larger volume furnaces have automated conveyor systems that allow many parts or products to be treated at a time. Their controlled atmospheres can be oxidizing, inert, salt bath or vacuum. Furnaces are also capable of aging, annealing, sterilizing and sintering materials, as well as melting raw substances for molding or casting purposes. Furnace specifications include temperature requirements, pressure, internal width, length and height, as well as heat source. There are many different furnace heat sources available today. They include radiant, natural gas, induction, conduction, electrical and dielectric. Each method has specialized benefits, limitations and applications. Radiant heat furnaces are similar to wood stoves and portable heaters. They use a flame to heat an object, commonly a ceramic plate. This object gives off heat that transfers throughout the area. Natural gas furnaces are very common. Compared to electric furnaces , they are an economical method of creating a high heat environment. They burn natural gas or propane in order to generate heat, and are used for their high temperature abilities. Induction furnaces use a combination of electrical resistance and hysteresis losses to heat metal parts. They are exposed to a magnetic field around a coil-carrying alternating current. Induction furnaces are the first choice in metal melting applications and are often used by iron foundries. Electric furnaces are also popular for melting metal. The most common type is an electrical arc furnace, which uses high amounts of electrical current, which travels through a metal arc and is conducted onto large amounts of scrap metal. The current heats the scrap metal to a high enough degree to melt it completely. These furnaces are mostly used for recycling metal parts to be formed into new products.

Chapter 2 : Furnace - Wikipedia

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Natural draft[edit] Diagram of natural draft gas furnace, early 20th century. The first category of furnaces are natural draft, atmospheric burner furnaces. These furnaces consisted of cast-iron or riveted-steel heat exchangers built within an outer shell of brick, masonry, or steel. The heat exchangers were vented through brick or masonry chimneys. Air circulation depended on large, upwardly pitched pipes constructed of wood or metal. The pipes would channel the warm air into floor or wall vents inside the home. This method of heating worked because warm air rises. The system was simple, had few controls, a single automatic gas valve, and no blower. These furnaces could be made to work with any fuel simply by adapting the burner area. They have been operated with wood, coke, coal, trash, paper, natural gas, fuel oil as well as whale oil for a brief period at the turn of the century. Furnaces that used solid fuels required daily maintenance to remove ash and "clinkers" that accumulated in the bottom of the burner area. In later years, these furnaces were adapted with electric blowers to aid air distribution and speed moving heat into the home. Gas and oil-fired systems were usually controlled by a thermostat inside the home, while most wood and coal-fired furnaces had no electrical connection and were controlled by the amount of fuel in the burner and position of the fresh-air damper on the burner access door. Forced-air[edit] The second category of furnace is the forced-air, atmospheric burner style with a cast-iron or sectional steel heat exchanger. Through the s and s, this style of furnace was used to replace the big, natural draft systems, and was sometimes installed on the existing gravity duct work. The heated air was moved by blowers which were belt driven and designed for a wide range of speeds. These furnaces were still big and bulky compared to modern furnaces, and had heavy-steel exteriors with bolt-on removable panels. This style furnace still used large, masonry or brick chimneys for flues and was eventually designed to accommodate air-conditioning systems. Forced draft[edit] The third category of furnace is the forced draft, mid-efficiency furnace with a steel heat exchanger and multi-speed blower. These furnaces were physically much more compact than the previous styles. They were equipped with combustion air blowers that would pull air through the heat exchanger which greatly increased fuel efficiency while allowing the heat exchangers to become smaller. These furnaces may have multi-speed blowers and were designed to work with central air-conditioning systems. A condensing furnace Condensing[edit] The fourth category of furnace is the high-efficiency, or condensing furnace. This style of furnace includes a sealed combustion area, combustion draft inducer and a secondary heat exchanger. Because the heat exchanger removes most of the heat from the exhaust gas, it actually condenses water vapor and other chemicals which form a mild acid as it operates. The vent pipes are normally installed with PVC pipe versus metal vent pipe to prevent corrosion. The draft inducer allows for the exhaust piping to be routed vertically or horizontally as it exits the structure. The most efficient arrangement for high-efficiency furnaces include PVC piping that brings fresh combustion air from the outside of the home directly to the furnace. Normally the combustion air fresh air PVC is routed alongside the exhaust PVC during installation and the pipes exit through a sidewall of the home in the same location. Single-stage[edit] A single-stage furnace has only one stage of operation, it is either on or off. One of the benefits to a single-stage furnace is typically the cost for installation. Single-stage furnaces are relatively inexpensive since the technology is rather simple. Two-stage[edit] A two-stage furnace has to do two stage full speed and half or reduced speed. Depending on the demanded heat, they can run at a lower speed most of the time. They can be quieter, move the air at less velocity, and will better keep the desired temperature in the house. Modulating[edit] A modulating furnace can modulate the heat output and air velocity nearly continuously, depending on the demanded heat and outside temperature. This means that it only works as much as necessary and therefore saves energy. Heat distribution[edit] The furnace transfers heat to the living space of the building through an intermediary distribution system. If the distribution is through hot water or other fluid or through steam, then the furnace is more commonly called a boiler. One advantage of a boiler is that the furnace can provide hot water for bathing and washing dishes, rather than requiring a separate water heater. One disadvantage to this type of application is when the boiler breaks down, neither heating nor

domestic hot water are available. Air convection heating systems have been in use for over a century. Forced-air gas furnace, design circa By comparison, most modern "warm air" furnaces typically use a fan to circulate air to the rooms of house and pull cooler air back to the furnace for reheating; this is called forced-air heat. Because the fan easily overcomes the resistance of the ductwork, the arrangement of ducts can be far more flexible than the octopus of old. In American practice, separate ducts collect cool air to be returned to the furnace. At the furnace, cool air passes into the furnace, usually through an air filter, through the blower, then through the heat exchanger of the furnace, whence it is blown throughout the building. One major advantage of this type of system is that it also enables easy installation of central air conditioning , simply by adding a cooling coil at the outlet of the furnace. Air is circulated through ductwork , which may be made of sheet metal or plastic "flex" duct, and is insulated or uninsulated. Unless the ducts and plenum have been sealed using mastic or foil duct tape, the ductwork is likely to have a high leakage of conditioned air, possibly into unconditioned spaces. Another cause of wasted energy is the installation of ductwork in unheated areas, such as attics and crawl spaces; or ductwork of air conditioning systems in attics in warm climates. Central heating A home furnace is a major appliance that is permanently installed to provide heat to an interior space through intermediary fluid movement, which may be air , steam , or hot water. Heating appliances that use steam or hot water as the fluid are normally referred to as a residential steam boiler or residential hot water boiler. The most common fuel source for modern furnaces in North America and much of Europe is natural gas ; other common fuel sources include LPG liquefied petroleum gas , fuel oil and in rare cases coal or wood. In some areas electrical resistance heating is used, especially where the cost of electricity is low or the primary purpose is for air conditioning. The Manufacture of Iron -- Filling the Furnace, an wood engraving In metallurgy , several specialized furnaces are used. Furnaces used in smelters , including:

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Chapter 3 : Heat Treating Furnace Manufacturers | IQS Directory

*Practical Industrial Furnace Design [Matthew H. Mawhinney] on calendrierdelascience.com *FREE* shipping on qualifying offers. To create interest in investigation of the waste to be found in the many forms of industrial furnaces and clarify the factors which affect furnace operation.*

Preventative Maintenance for Heat Treating Furnaces Heat treating furnaces play an important role in many metallurgical manufacturing operations including tempering, preheating, quenching, stress relieving, normalizing, aging, heat treatment solution, annealing, hydrogen embitterment relief, and more. These processes are often performed continuously, and that is why preventative maintenance on heat treating furnaces is crucial. This can prolong the overall lifespan of your equipment as well as minimize the possibility of debilitating downtime. The most important part of preventative maintenance is regularly scheduled thorough inspections of the heat treating equipment. Inspections can catch small issues before they become Read More businessIndustry Information Heat Treating Furnaces Heat treating furnaces heat a material and then bring it to a desired temperature. From there the material is cooled, which allows the furnace to instill increased strength, or aging within the material. This allows manipulation of the material to alter the physical, chemical and mechanical properties. The physical properties most often refer to how hard or soft the material is. Heat treating furnaces add billions of dollars per year in value to metal products, especially steel and nonferrous products, by imparting specific properties to the parts. These properties are often critical to the proper function of the heat-treated parts. Some of the industries that are served by heat treating furnaces include pharmaceutical, automotive, packaging, assembly, electronics and textile. Techniques used by heat treating furnaces include precipitation strengthening, annealing , aging, quenching, tempering and selective hardening. Hardening can be broken down further to differential, flame, induction or case hardening. Precipitation strengthening involves changes in solid solubility as temperature varies. Annealing can be used for normalizing or stress relieving and comprises the processes of heating, holding temperature and then cooling in order to accomplish a specific state for the material being heated. Aging or precipitation hardening results in a softer metal. Quenching is quickly cooling from a high temperature. Tempering is often used on brittle materials to make it tougher, it can also be used to manipulate the color of the metal. Case hardening involves making the surface layer of a steel material substantially harder through heat treating. Heat treating furnaces employ a process that involves three steps. First, the part is heated to a specified temperature up to It is then held at that temperature for the required amount of time, which may be as short as a few seconds or as long as 60 hours. Finally, the part is cooled either in the furnace or by quenching methods, depending on how quickly the part needs to be cooled. Things to keep in mind when purchasing are uniformity, control, airflow and rate of rise. Uniformity is ensuring the temperature is the same throughout the system. Control regards how easily the system is monitored and adjusted. Finally, rate of rise regards to how fast you want to be able to increase the temperature.

Chapter 4 : Industrial Furnace Manufacturers/Suppliers | IQS Directory

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Chapter 7 : Aluminum Furnaces | Aluminum Heat Treating

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Chapter 8 : Practical industrial furnace design, (Book,) [calendrierdelascience.com]

KLM Technology Group Project Engineering Standard PROCESS DESIGN OF FURNACES (PROJECT STANDARDS AND SPECIFICATIONS) Page 3 of 33 Rev: 01 April Damper - A damper is a device for introducing a variable resistance for.