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# Commercial Energy Auditing Reference Handbook, 4th Edition

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This practical reference consolidates essential data, tools, and insights for energy professionals into a single, time-saving resource. Combining tables, charts, and key facts with real-world context, it highlights system interactions, trade-offs, synergies, and common pitfalls. The book emphasizes optimization strategies that preserve occupant comfort and business operations, covering efficiency assessments, retrofit approaches, automated controls, and methods for estimating—and sustaining—energy savings. While focused on commercial buildings, the guidance extends to industrial applications, including process optimization, heat recovery, steam systems, compressed air, power factor correction, and water treatment. The 4th edition features updated content and expanded coverage of demand management, interval data analysis, balance temperature applications, advanced heat pump systems, lighting efficiency, regression techniques, and tertiary pumping optimization. Drawing on over 30 years of experience and 300+ energy audits, this trusted resource delivers practical, field-tested knowledge for improving energy performance.

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**KEYWORDS:**
energy audit energy management water management water efficiency building energy use DSM demand side management demand response demand management demand limiting automatic control process control compressed air efficiency regression of energy use interval data energy use intensity energy savings opportunities energy use intensity control optimizing HVAC control strategies most-open-valve control heat exchanger approach maintenance energy benefits quantifying energy savings load-following concept (for energy management) measurement and verification M&V energy efficiency measure interactions HVAC load profile load profile efficiency profile bin weather psychrometrics balance temperature for buildings thermal balance weather dependence ventilation cost thermal storage heat recovery district heating load factor control sequences that do not work or work poorly HVAC economizer process humidification energy savings decline thermal energy transport part load HVAC efficiency tertiary pumping refrigeration cycle evaporative cooling spot cooling cold climate heat pump high lift heat pump motor loss sources power factor correction combustion efficiency flue gas heat recovery compressed air compressor control compressed air leaks capacity modulation for fans and pumps synchronous belts affinity laws wire-to-water efficiency pumps with lift task lighting lighting levels

stack effect infiltration building load coefficient overall U-value glazing properties standby losses for water heater standby losses for boiler degree-days emission conversion factors coefficient of performance load factor (for electricity use) altitude correction process water reverse osmosis ultra-pure water cooling tower water use cycles of concentration water accounting regression for energy management regression indicators data center efficiency data center power food chain hot aisle HVAC for data center cold aisle HVAC for data center overlapping heating-cooling in HVAC HVAC retrofits proportional pumping energy survey look-for items simple payback vs. internal rate of return evaporation loss from heated tanks integrated design service life of various components Indoor air quality mistakes Net Zero definitions building lease definitions building commissioning definitions equate energy savings to profit increase

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