

“Factual Knowledge of the Facility Environment Can Lead to Significant Savings”

WHITE PAPER

DATA CENTER & FACILITY ENVIRONMENTAL PERFORMANCE MANAGEMENT

Executive Summary

The energy demand of data centers is a significant cost factor, and that demand is growing at a rate of 12% per year. Approaches used to mitigate this energy cost often require significant investment by the data center owner. Valbrea Technologies has developed a custom, automated solution, **Valtere**, which provides factual knowledge of a data center’s key environmental variables. With this knowledge, data center management can optimize the environmental performance of their current facility by making targeted low cost modifications and achieve up to a 20%+ reduction in their energy costs. The facility evaluation and modifications can be made very quickly, which make it an extremely attractive pay back from what you can employ in your data center.

Introduction

Environmental performance management involves optimization of facility cooling system delivery and humidity control. Effective performance management requires clear definition of the goals, accurate and repeatable measurement of data collection, uncomplicated storage of documented data, and ready analysis and interpretation of the data. Once the analysis and interpretation are complete, next steps require implementation of changes to optimize the environmental management of the facility. Validation of the outcome is completed utilizing a continuous process improvement methodology based on continued data collection, analysis and optimization. The most critical aspect is to measure the environmental components with a structured and repeatable method. Standardized and consistent methods must be utilized for successful trending and benefit analysis.

Problem

The necessity to control energy demand and expense in high use facilities, such as data centers, becomes more critical as unit cost increases and regulatory pressures necessitate a reduction of energy consumption. The pressure on the facilities manager to ensure 100% operation, coupled with the lack of proper tools to understand true cooling needs, often lead to cooling beyond the actual need of the equipment, thereby contributing to spiraling energy cost. The current problem facility managers encounter is the need to make broad assumptions about the cooling needs within a facility without the benefit of detailed data or analysis of the real-time environment. The environment is dynamic, not static. Continued optimization requires some frequency of reevaluation and adjustment. Theoretical models, such as computational fluid dynamics (CFD) modeling systems, can be created to determine expected temperatures, air flows, etc., but the latency of accurate inventory placement and equipment information degrades the accuracy beyond the margin of error already inherent in theoretically

generated results, not to mention the sizable licensing costs associated with many of these types of systems.

Background

Primary issues for facilities and IT managers are the requirements and efficiency of power and cooling management. Their cooling and environmental management responsibilities continue to be a major part of annual expenses. Not only are energy costs increasing at faster rates, but the energy demands are increasing at the same time. Inefficiencies and mismanagement of air flow control, humidity control, and temperature control result in excessive expenditures for cooling needs. Without standardized, reliable data collection and analysis, facilities and IT managers must rely on spot checks and guesswork in making decisions about the management of the facility environment. Without the proper tools and standardized processes to collect and analyze the environmental data, measurement of success is arbitrary. The goal of achieving a common temperature inflow into a facility combined with maintaining the optimum operating temperature of facility equipment is impossible to determine without consistent, detailed data gathering and analysis. Spot checking of temperatures in a facility provides a view of an isolated reading of temperature without relative understanding of the air flow path and impact.

Efficient environmental management of a facility requires:

- (1) knowledge of current cooling requirements
- (2) understanding of current performance and cost
- (3) determination of inefficient under-cooling and over-cooling
- (4) interpretation and understanding of needed adaptations of environmentally controllable elements
- (5) capacity planning by which you determine reasonable future requirements

Because of the substantial cost of facility cooling, facilities and IT managers are willing to implement one or more tools to manage their cooling efficiency and capacity. One solution is computational fluid dynamics (CFD). CFD is a technique for analyzing computer generated simulations of airflow and thermal conditions in enclosed spaces. The issue with CFD modeling is the dependency on a complex database of equipment specifications, equipment location, cooling system modeling that must be created and maintained with accurate data. Even when this is done and upkeep of the database is an issue, the results are theoretical in nature and can not account for real-world characteristics. The initial and ongoing time and money requirements many times outweigh the benefits of CFD in operational data centers. Another approach is to expend a substantial amount of resource time collecting similar real data throughout the facility and then attempting to analyze the data. In most situations, the excessive, recurring cost of labor and error prone data collection methods makes this an unrealistic option.

Technical Solution

Valbrea Technologies has developed a patent-pending technology that delivers an immediate solution to facilities and IT managers of data centers. The solution provides the manager real-time insight into the environmental operating conditions of the facility without the time and expense of computational

fluid dynamics modeling or similar systems. Valtere, Valbrea's Mobile Platform for Data Centers, is an autonomous robotic and software system that systematically collects and analyzes humidity, temperature, and air flow at any level of granularity required. The systematic, non-intrusive collection of data at user defined points of any accessible X-Y-Z position throughout the facility is accurate and repeatable. One of the critical items of data is the direction and velocity of the air flow. This critical component of environmental assessment can not easily be collected through other manual methods. The application of air flow information into the equation provides insight into the real impact of changes in air flow. Without understanding the interactions of all of the temperature and humidity variables in the environment relative to air flow, true optimization of the environmental management within a facility can not be achieved.

The Valtere System is comprised of an autonomous robot, highly sensitive instrumentation, close tolerance and calibrated positioning hardware and unique custom developed software. The autonomous feature of the robot enables the Valbrea technician to map out the unique configuration of a data center without having to install any wires or equipment to assist in its guidance. The physical configuration of the robot allows it to easily move about the data center in close proximity to equipment and take readings at any granularity required by the data center manager. The Valtere System will collect an enormous amount of environmental data, organize it and present the analysis in an easy to understand format. Iterative comparisons are also provided to validate the improvement actions taken and evaluate periodic assessments.



The graphical depiction of the environmental elements of air flow, temperature and humidity at each level of granularity required allows managers the ability to make intelligent decisions with regard to the management of environmental control systems and air flow control. *See Figure 1. Temperature and Air Flow Distribution (Topographic).*

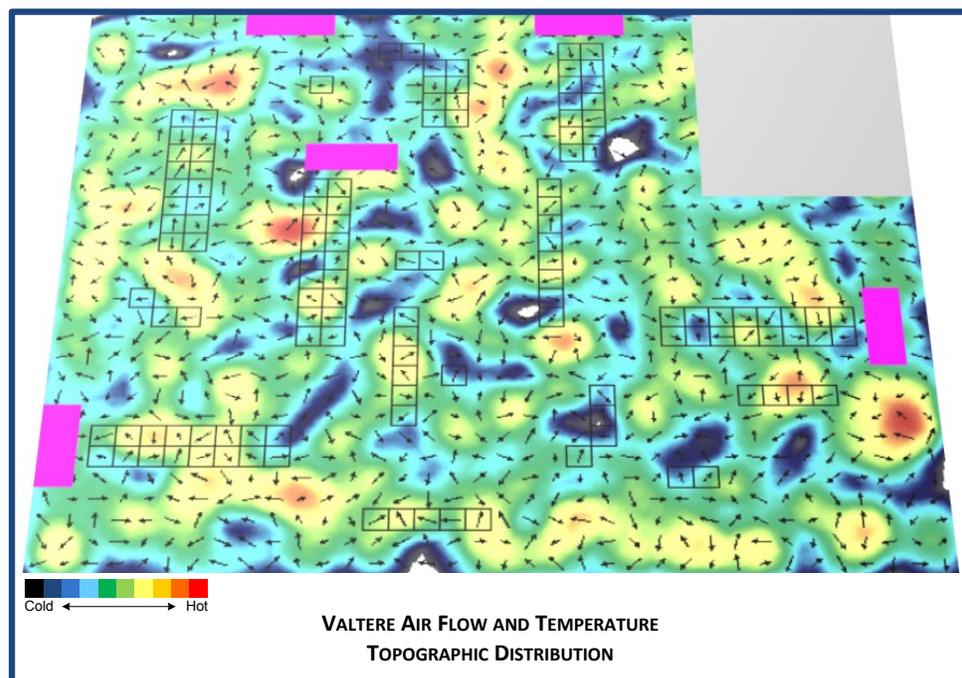


Figure 1. Temperature and Air Flow Distribution (Topographic)

The collection and storage of data using Valbrea's Mobile Platform for Data Centers is accurate and repeatable. The initial assessment is saved as a baseline of the current operational efficiencies. Repeatable and subsequent collection and assessment of the data at identical locations throughout the facility provides insight into the real efficiencies gained through facility changes and then avails opportunities for additional improvement.

Computational analysis of real data against selectable, desired standards and reports provide additional detailed assessment of an environment never before attainable. The collection and storage of data using Valbrea's Mobile Platform for Data Centers is accurate and repeatable. The initial assessment is saved as a baseline of the current operational efficiencies. Repeatable and subsequent collection and assessment of the data at identical locations throughout the facility provides insight into the real efficiencies gained through facility changes and then avails opportunities for additional improvement. *See Figure 2. Valtere Process Flow.*

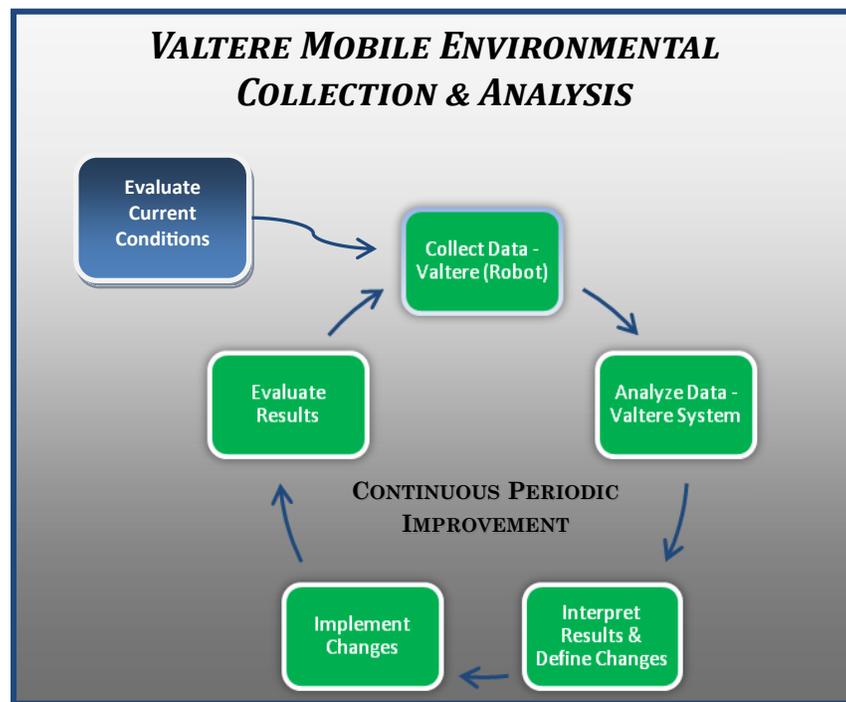


Figure 2. Valtere Process Flow

Business Benefits

The assessment and interpretation of the current environmental operating condition of your facility will generate cost savings in environmental management and cooling costs on a repeatable basis. In addition to the obvious benefit of tremendous cost savings, up to 20% or more, resulting from this proprietary technology provided by Valbrea, your business will also realize benefits of:

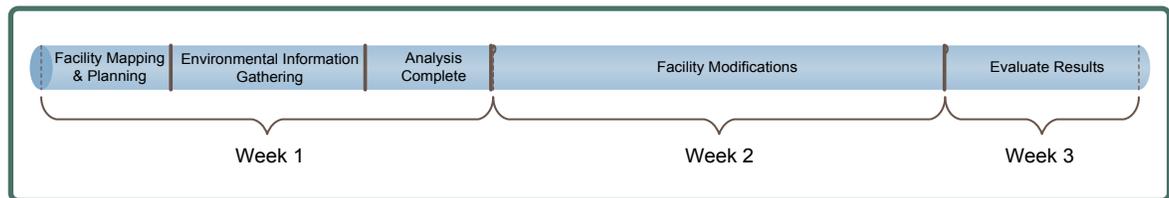
- (1) Storage of accurate & real data that can be utilized with other systems and analysis.
- (2) A floor plan of the current physical state of the facility with an accuracy of 10mm and better.

- (3) Immediate results from each analysis.
- (4) Repeatable for Baseline comparison and accurate improvement depictions.

Business Case

The assessment of a facility using Valbrea’s Mobile Platform for Data Centers is provided as a service. Valbrea utilizes one of its autonomous mobile platform systems and software at your facility and performs the following:

- (1) Maps the facility to an accuracy within 10mm.
- (2) Generates the data collection plan to the granularity desired.
- (3) Gathers and stores the humidity, temperature, and air-flow data at each of the X-Y-Z coordinates throughout the facility.
- (4) Generates graphical analysis of the data.
- (5) Presents the graphical analysis along with summaries and prioritized areas of opportunity of improvement.
- (6) Provides the stored data in a standard database format.



Typical Valbrea Mobile Environmental Collection & Analysis Cycle

Valbrea provides this service on a fixed price basis in most cases. The fee of an assessment completed by Valbrea will almost always represent a very small portion of the potential cost savings received from changes implemented as a result of the complete understanding of the environmental operations. Estimated savings are up to 20% or more of the annual environmental management and cooling costs. In some cases this can equate to over \$1.00 per square foot per month of savings. Subsequent follow-up assessments by Valbrea provide the opportunity for identification of additional efficiency gains and maintenance of cost savings already observed.

Additional Potential Incentives

Your utility or state energy efficiency program may have available incentives that could potentially cover a portion or all of the cost to evaluate and improve your current environmental performance.

Here are the steps that typically are involved in preparing the information required to make an energy incentive request from your utility or an energy efficiency incentive program. This represents the general approach to preparing an incentive application, but specific requirements may vary by utility or program:

1. ***Identify available programs:*** Contact your electrical utility or state energy efficiency program to determine what energy efficiency incentives may be available for data center energy efficient improvement projects. It is important to complete this step early in the process. Some incentive programs have detailed application procedure and require project pre-notification.

Additional Potential Incentives (Continued)

2. *Assess existing power usage:* Determine the power usage for the total data center to which you are going to make the improvement. Monthly data will capture the usage impacted by outdoor temperature and humidity conditions.
3. *Work with available project design and energy efficiency teams:* Many energy efficiency groups will provide project support to help you maximize the energy efficiency gains, cost savings and incentives in your project. Partnering with your utility also helps you assure that you are meeting all of the requirements for the program.
4. *Calculate the energy savings from your project:* Perform direct measurements of your power usage after your project is implemented or perform calculation of the energy savings benefits. Your utility of efficiency program can help you with this requirement.
5. *Submit a final incentive application:* Enjoy the benefits of your energy saving project, submit your request for your incentive payment and publicize your efforts to be more energy efficient and help the environment. Incentive amounts generally will depend on the amount of energy saved and vary by program.

Summary

Valtere is the complete system for Planning, Executing, Evaluating and Improving the reliability, current efficiency and operational state of your facility. Data center monitoring solutions and assessments are a critical part of IT infrastructure management. Discover with Valbrea how real-time data can be accurately gathered, analyzed and used by management to make intelligent, repeatable decisions to reduce significant energy consumption and operating costs.