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Risk and Reward:

How to mitigate liquid cooling concerns in advanced data centers

OCP GLOBAL SUMMIT

NOVEMBER 9-10, 2021

R&P

Risk and Reward:

How to mitigate liquid cooling concerns in advanced data centers

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Overview

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OPEN Compute Project

Leak Detection and Intervention

Revision 1.0

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VERTIV

nVent

CoolIT systems

intel

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Problem Statement

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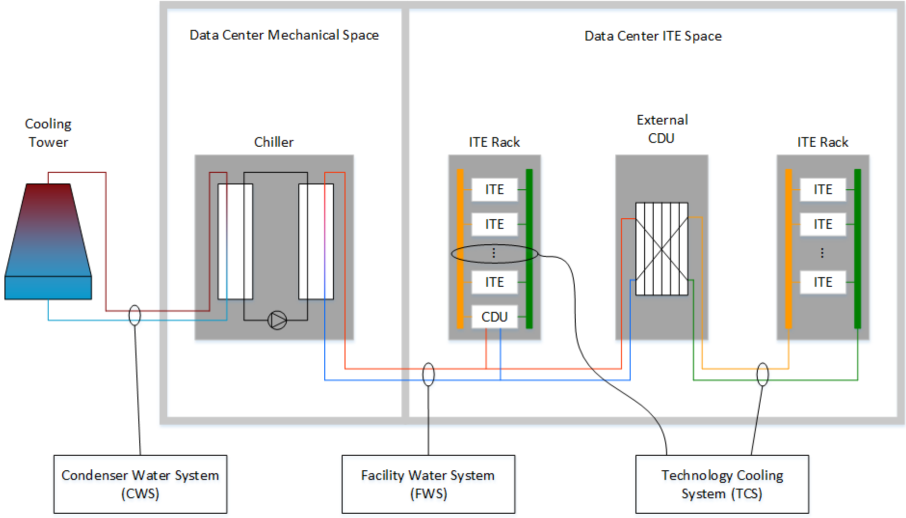
Problem Statement:

Whitepaper documenting detection and intervention techniques will help grow industry awareness and minimize risk in systems.



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Risk Concerns

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- Liquid may already exist in the data center but bringing it inside IT equipment causes customer concern
- Leak Detection, Mitigation and Intervention are important to data centers
- A Risk Analysis needs to be performed for a liquid cooled system including the risks around leaks
- Our whitepaper on Leak Detection, Mitigation and Intervention addresses these concerns by describing industry best practices with pros and cons of each technology

Definitions

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- **Detection:** detecting the leak event
- **Mitigation:** preventing the likelihood of the leak event
- **Intervention:** acting on the leak event
- **Conductive Fluid:** Coolant fluids that conduct electric current where both negative and positive particles are present.
- **Non-Conductive Fluids:** Coolant fluids that are not capable of conducting electric current. Also known as di-electric fluid.
- And many more included in the whitepaper

Leak Detection and Mitigation

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Examples of indirect detection include:

- Monitor changes in differential liquid coolant pressure over time
- Monitor changes in liquid coolant level in reservoir
- Optical sensor that monitor liquid coolant build up in target areas
- Turbidity sensors for refrigerant

Examples of direct detection include:

- Cable sensors
- Point leak detection sensors

Leak Intervention

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- An intervention can be manual or automated based on a variety of detection methods
- A manual intervention would occur when a notification went out to facility personnel that a leak has been detected
- During an example automatic electrical intervention, a notification is sent of a leak event and an automatic electrical de-energization is done of the IT equipment
- Optical sensors can be integrated into the ITE BMC for simplicity of installation and automatic reaction

Dielectric Design Considerations

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Due to non-conductive property, direct leak detection is limited to:

- Reservoir level
- Optical Sensors

Indirect leak detection can be achieved by:

- Changes in differential pressure over time
- Heat rejection capacity

See section 5.3 of Immersion Requirements Document for other design considerations.

Rewards

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INCREASED RACK DENSITY

Enable 100% utilization of rack and data center spaces

OPTIMIZED PERFORMANCE

Facilitate peak performance for higher powered processors

MAXIMUM ENERGY EFFICIENCY

Significantly reduce total data center energy consumed and OpEx

Key Learnings

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- The best method for preventing a leak comes from engineering design principles and rigorous production testing.
- Installation and commissioning best practices play a significant role preventing leaks in equipment assembled on prem.
- The technology chosen to detect and mitigate leaks should be determined by the facilities fluid type, risk analysis, cost analysis and operation impact study.
- Liquid cooling is safe and reliable with many installations worldwide since the 1960s.

Call to Action

- Join the ACS Cold plate Calls: ACS Cold Plate » Open Compute Project
- Whitepaper Link: https://www.opencompute.org/documents/acs-cold-plate-leak-detection-and-intervention-white-paper-pdf-1

Additional Resources:

- Integration and Logistics Whitepaper: ocp-liquid-cooling-integration-and-logistics-white-paper-revision-1-0-1-pdf
- Immersion Requirements Document: ocp-acs-immersion-requirements-specification-1-pdf

Open Discussion