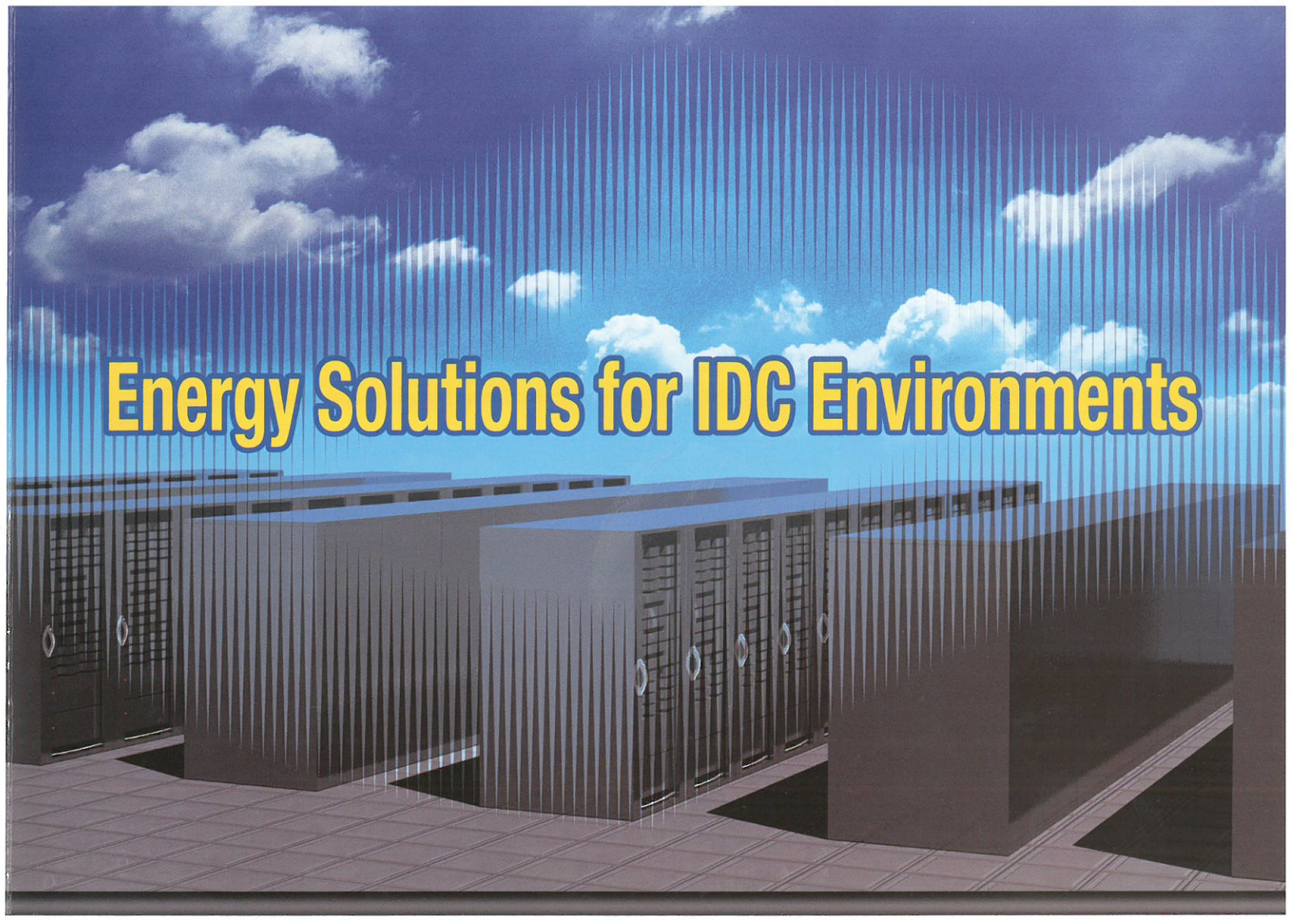

IDC Side-Flow Cooling System

IDC-SFLOW®

&

Green Air Service for IDCs

Green Air IDC

Takasago Thermal Engineering Co.,Ltd.

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2014 Sep

Side-Flow Air Conditioning for IDCs
"IDC-SFLOW®"

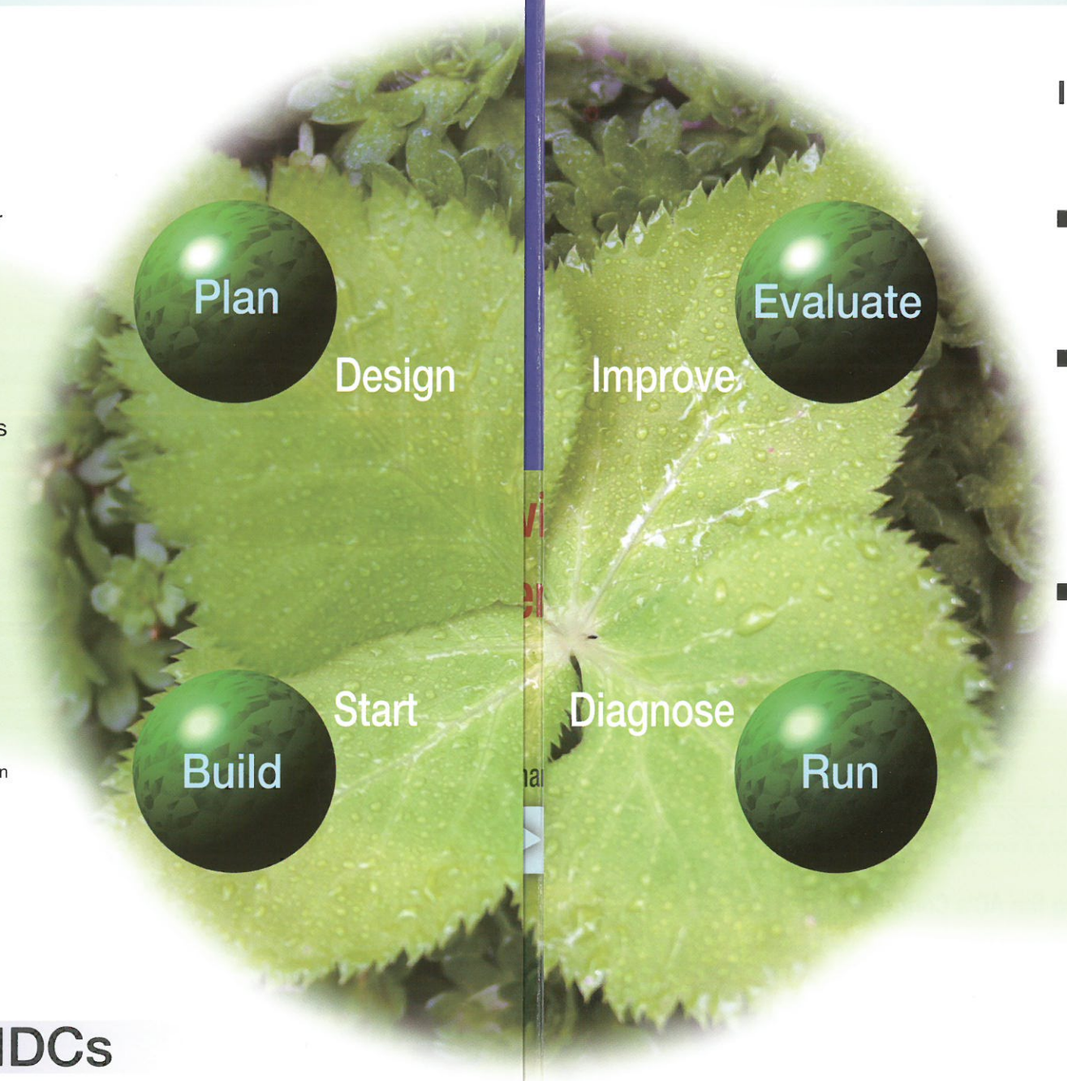
Air Conditioning Systems Designed to Support Environment-Friendly IDCs

- By supplying air directly from the side walls of the server room, we significantly reduce the energy needed for fan power. As our systems do not require any underfloor space, storey height can be kept low.

- By employing technology that achieves uniform temperature over the entire rack intake side, our systems can deliver effective cooling of your IT equipment even when using relatively warm supply air. As a result, these systems can support long-term use of outside-air cooling, free cooling, and other natural energy solutions.

- When compared with conventional underfloor air distribution approach, our systems significantly reduce energy consumption. These systems have achieved Japan's highest PUE* ratings (approx. 1.2).

  *The PUE (power usage effectiveness) value varies according to the proportion of natural energy used.



Green Air Service for IDCs
"Green Air IDC"

IDC Lifetime Support Service

- Wide menu of diagnostic and tuning services. We are ready to deliver the services that will best meet your needs.

- Our diagnostic capabilities leverage our long experience with design and simulation technologies. We are ready to support our systems over their entire life cycle—from planning through usage and follow-up adjustments.

  Simulations are based on CFD analysis, which predicts the thermal environment within the room.

- By using thermal cameras to focus on important points in the system, we can rapidly produce highly accurate diagnosis from a limited number of temperature measurements.

Life-Cycle Service for IDCs

Our company offers comprehensive lifetime support for IDC-optimized air conditioning systems. We start by evaluating your operational thermal environment and energy profile, and by proposing and implementing energy-saving tuning solutions. We can then plan, design, and launch an optimal system for your site, and follow through with support services throughout the system's life.

As a leading company in the area of thermal and energy technologies, we look forward to bringing our experience and creativity into close partnership with our customers.

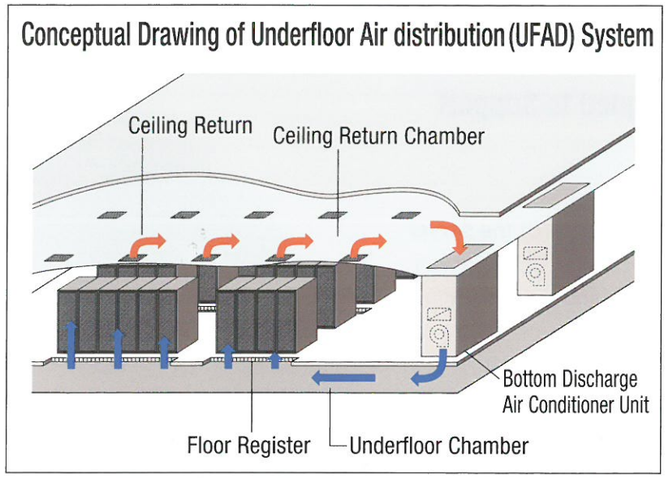
IDC Side-Flow Cooling System

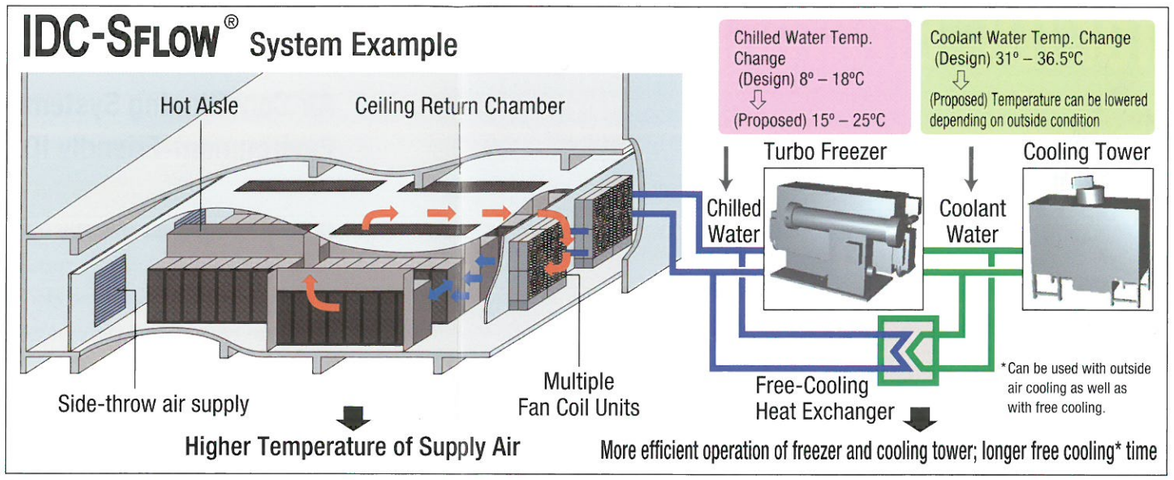
"IDC-SFLOW®" (IDC SIDE FLOW System)

Reliable, Energy-Efficient, Cost-Effe

Tier PUE TCO

Ideal for advanced IDC settings; low environmental footprint

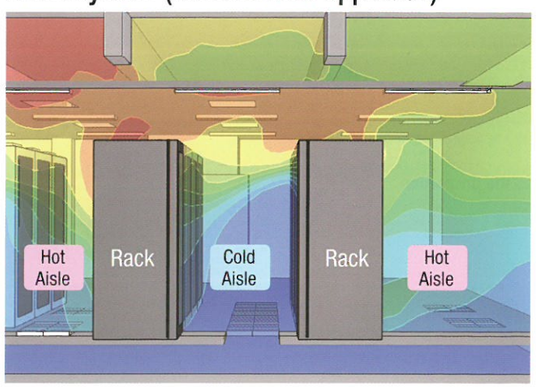


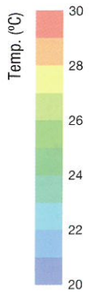


Patent Applications: 2010-274493; 2010-274777; 2010-290015

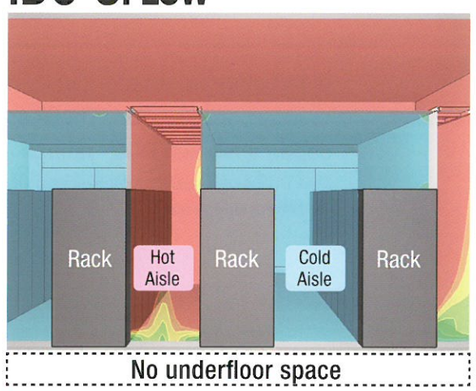
Comparison

UFAD System (conventional approach)





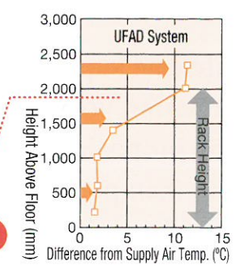
IDC-SFLOW®



No underfloor space

■Circulating hot air up the upper part of the racks.

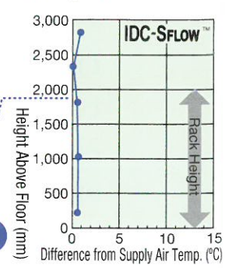
Temperature of supplied air must be reduced to compensate for heating of the rack tops.



Warmer at rack top.

■Rack intake temperature is uniform, and closer to supplied-air temperature.

Because intake temperature is uniform over the full height of the rack, effective cooling can be achieved even when using warmer supplied air.



Uniform temperature over full rack height.

Configuration

- Side-throw air supply
- Air supply into cold aisles
- Hot-aisle boundaries
- Multiple Fan Coil Units

Features

- Fan power: 1/3 that of conventional system (as calculated by Takasago)
- Non-uniform distribution of rack intake temperatures: 1/4 that of conventional system
- Cooling capacity: 6 kW/rack (average)
  (Can achieve local cooling up to 17 kW/rack.)
- Underfloor space: Not required
- PUE: Highest in Japan (about 1.2)

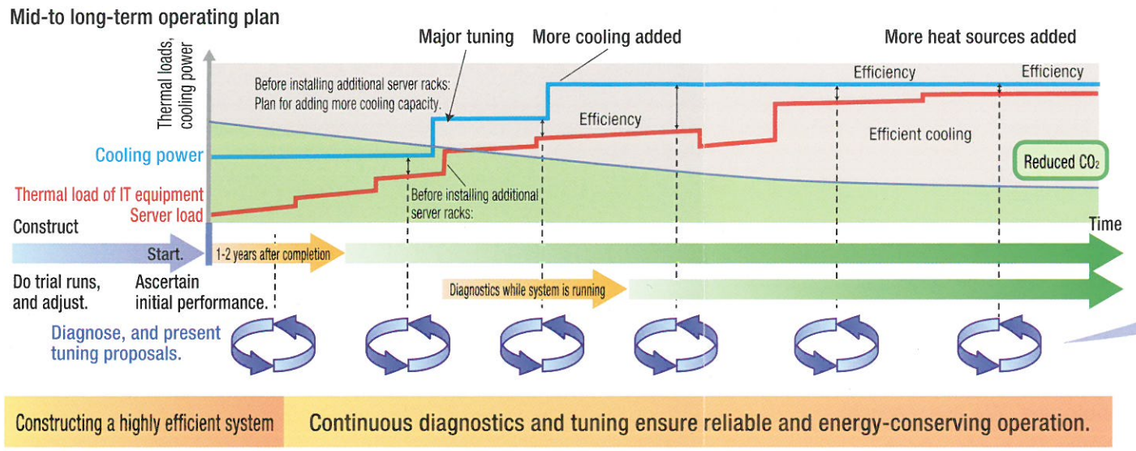
System Reliability

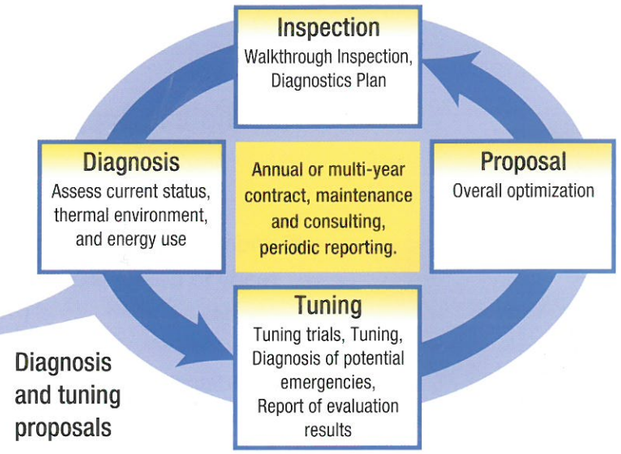
- Use of multiple fan coil units makes it easy to install a system with N+1 redundancy.
- Use of the server room as a plenum chamber results in a large cool-air space, extending the allowable down time in the event of an equipment failure or power outage.

ctive, and Eco-Friendly "Green" IDC

An eco-friendly air service for IDCs
"Green Air IDC"

Our services can keep operations effective over the entire life of your IDC.





Approach

- Walk-through inspection
- Diagnosis and tuning
- Proposals for overall optimization

Features

- Uses proven diagnostic techniques
- Large selection of diagnostics and tuning methods
- Can proceed into one-stop service

Service Record To Date

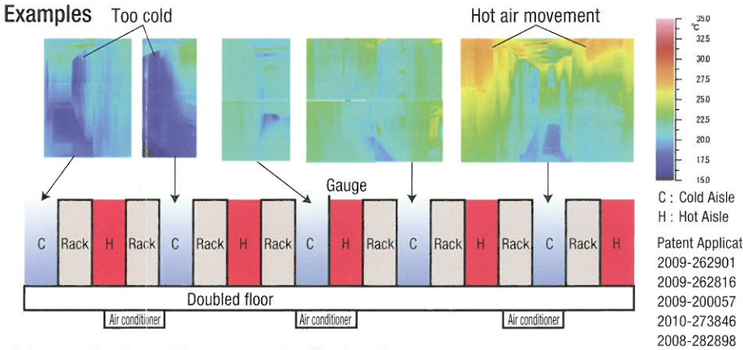
- IDCs in Japan: Over 90 installations
- IDCs Overseas: 5 installations (As of July, 2014)

Tiers : Metric for the reliability of data storage; based on redundancy, storage media type, etc.
PUE : Power usage effectiveness = IDC's total power consumption / IT equipment's power consumption
TCO : Total cost of ownership (cost over entire life cycle)

Diagnosis

Using thermal cameras, obtain image (from above) of entire server room.
Use thermal cameras to focus on areas where thermal problems are likely to occur.

Case Examples

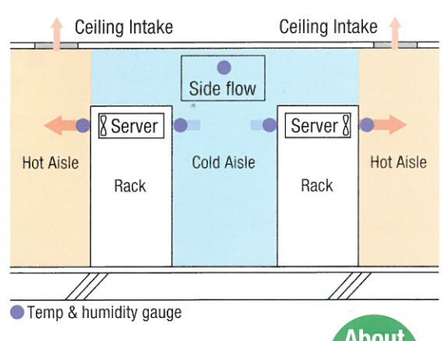


C : Cold Aisle
H : Hot Aisle

Patent Applications:
2009-262901
2009-262816
2009-200057
2010-273846
2008-282898

Side-Flow System

(with thermometers installed where servers would be installed)

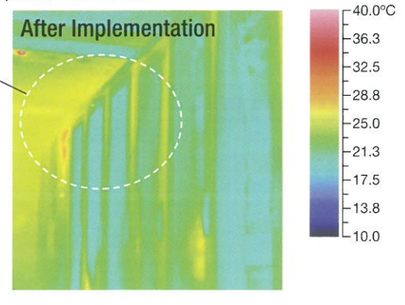


Tuning

Case Example 1 : Adjustment to Underfloor Distribution Airflow

To correct for the inadequacies of the underfloor distributed airflow: Adjusted the flow rate and flow direction from the AC, and installed more blanking panels on racks.

⇒ Lower temperatures at upper part of rack



Case Example 2 : Changing the AC's Control Setup

Changed AC to control air-supply temp. (instead of return air temp.), and changed the flow setting.
⇒ Reduced AC power by about 25% (for a savings of about 1.2 million yen per year, based on a rough calculation of energy costs).