Oil Immersion Cooling
Case Studies of Two Oil and Gas Data Centers
Dhruv Varma

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The CarnotJet™ System

Install any standard OEM rack server
» Any brand
» CPU and GPU compatible
» Fiber compatible

Submerge into ElectroSafe™ coolant
» Captures 100% of heat
» Requires no air cooling

Intelligent control system
» Heat expelled outside
» Alerts/monitoring software

Vertically mounted OEM server
Power cable guides
ElectroSafe™ coolant

Heat Flow
30° – 53° C Water

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Disclaimer

Information about installations are restricted under NDA. The format of this presentation is a quote by a customer, followed by GRC’s explanation of why this particular benefit is possible. GRC explanations use generic data.
CASE STUDY: CGG

Date first publicized: 2012
Size of installation: confidential (but growing)

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“What we are seeing is a significant saving in terms of electricity. I would say it’s not impossible to go up to a factor of two [power allocated to servers in a given data center]”

— Laurent Clerc, VP of Information Technology
## Power Savings Example
### Typical Installation Savings

<table>
<thead>
<tr>
<th></th>
<th>Air</th>
<th>Free Cooling</th>
<th>GRC</th>
<th>Watts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Servers</td>
<td>1000</td>
<td>1050</td>
<td>850</td>
<td></td>
</tr>
<tr>
<td>Cooling and Power</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overhead</td>
<td>70%</td>
<td>25%</td>
<td>9%</td>
<td>%</td>
</tr>
<tr>
<td>PUE</td>
<td>1.70</td>
<td>1.25</td>
<td>1.09</td>
<td>-</td>
</tr>
<tr>
<td>Total Power</td>
<td>1700</td>
<td>1313</td>
<td>927</td>
<td>Watts</td>
</tr>
<tr>
<td>Savings w/ GRC</td>
<td>46%</td>
<td>29%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$mPUE < 1.03$, any climate
“We saturated the power envelope of this room by putting twice as many systems as we would normally have, if it had a normal way of cooling systems.”

– Laurent Clerc, VP of Information Technology
Example Power Infrastructure

Average Power

<table>
<thead>
<tr>
<th></th>
<th>Conventional</th>
<th>Highly Efficient Air</th>
<th>GRC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Server Power</td>
<td>1 MW</td>
<td>1 MW</td>
<td>.85 MW</td>
</tr>
<tr>
<td>Air handler / GRC</td>
<td>.2 MW</td>
<td>.1 MW</td>
<td>.04 MW</td>
</tr>
<tr>
<td>“Other”</td>
<td>.5 MW</td>
<td>.25 MW</td>
<td>.09 MW</td>
</tr>
<tr>
<td>Total</td>
<td>1.7 MW</td>
<td>1.35 MW</td>
<td>.98 MW</td>
</tr>
</tbody>
</table>

Equipment sizing (since peak is higher than average)

<table>
<thead>
<tr>
<th></th>
<th>1.0MW</th>
<th>1.0 MW</th>
<th>.85MW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Battery Backup</td>
<td>1.2MW</td>
<td>1.1 MW</td>
<td>.85MW</td>
</tr>
<tr>
<td>Room Power distribution</td>
<td>1.9MW</td>
<td>1.45MW</td>
<td>1.02MW</td>
</tr>
</tbody>
</table>

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How to Nearly Double Your Data Center Server Capacity

Retrofit with GRC

Servers take ½ the floor space

Reallocate MEP power to servers (add battery backup if necessary)

Add 80% more servers into the same data center

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“Today there is not really much difference between managing this room [with the CarnotJet” and managing another traditional air based computer.... there’s no noise, almost no noise, the temperature is very reasonable, there’s no air draft, ... makes for a much nicer environment overall

— Laurent Clerc, VP of Information Technology
Unmatched efficiency.
Unmatched capital savings.
Unmatched simplicity.
For those serious about reducing data center cost.

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