



Science & Technology
Facilities Council

Computer Operations Group Data Centre Facilities



Hitendra Patel
June 2015



R89 Capacity

Computer rooms

- HPD
- LPD (Dual DX CRACs)
- UPS (Dual DX CRACs)

Rack Capacity

- Total 340. in-use 270

Power

- 8MW. In-use 980kW
- UPS 600kVA
- Cross-linked transformers

HVAC

- 4x Chiller @ 750kW each (N+1)
- Air Cooled (Glycol) with 26 CRACS including Dual DX CRACS
- In-row 12 units @ 48kW each



Operations Tasks And Challenges





June 2009 Water leak

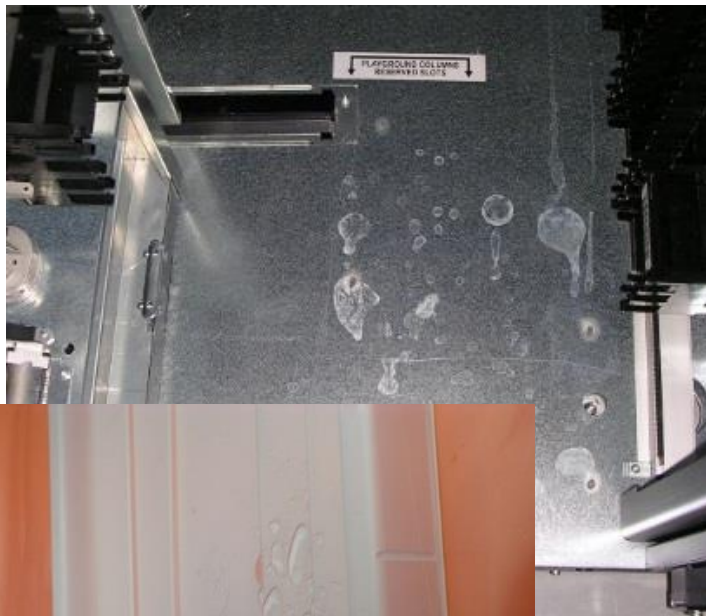
Effect

- Water leakage from AHU on the first floor identified.
- Water leaked into the SL8500 tape robot
- Water leak missed a rack in the HPD computer room

Solution

- Modified with overflow drainage
- Installed water detection system linked to the auto shut-off the water on the 1st / 2nd floor.
- Installed bund under the 1st floor kitchen

Water Leak





August 2009 Air Conditioning failure

Effect

- Complete air conditioning auto-shutdown
- All racks in the HPD computer room shutdown
- UPS and LPD computer room survived because of dual CRAC (DX and chilled-water)
- Cause was a faulty sensor
- HVAC system managed by BMS

Solution

- BMS reconfigured to act as slave/notification only
- Complete temperature sensors installed and alert notification setup

Air Conditioning Failure





November 2009

Noise in the UPS power supply

Effect

- Some EMC power supplies detecting auto-shutdown
- Critical Tier1 database racks affected
- UPS supply under-load 20% usage

Solution

- 100m power cable installed to reduced noise ***DID NOT WORK***
- Purchased 4kVA isolating transformers for each supply to the rack.
WORKED

4kVA isolating transformer





June 2010

Dust contamination in the HPD Computer Room

Effect

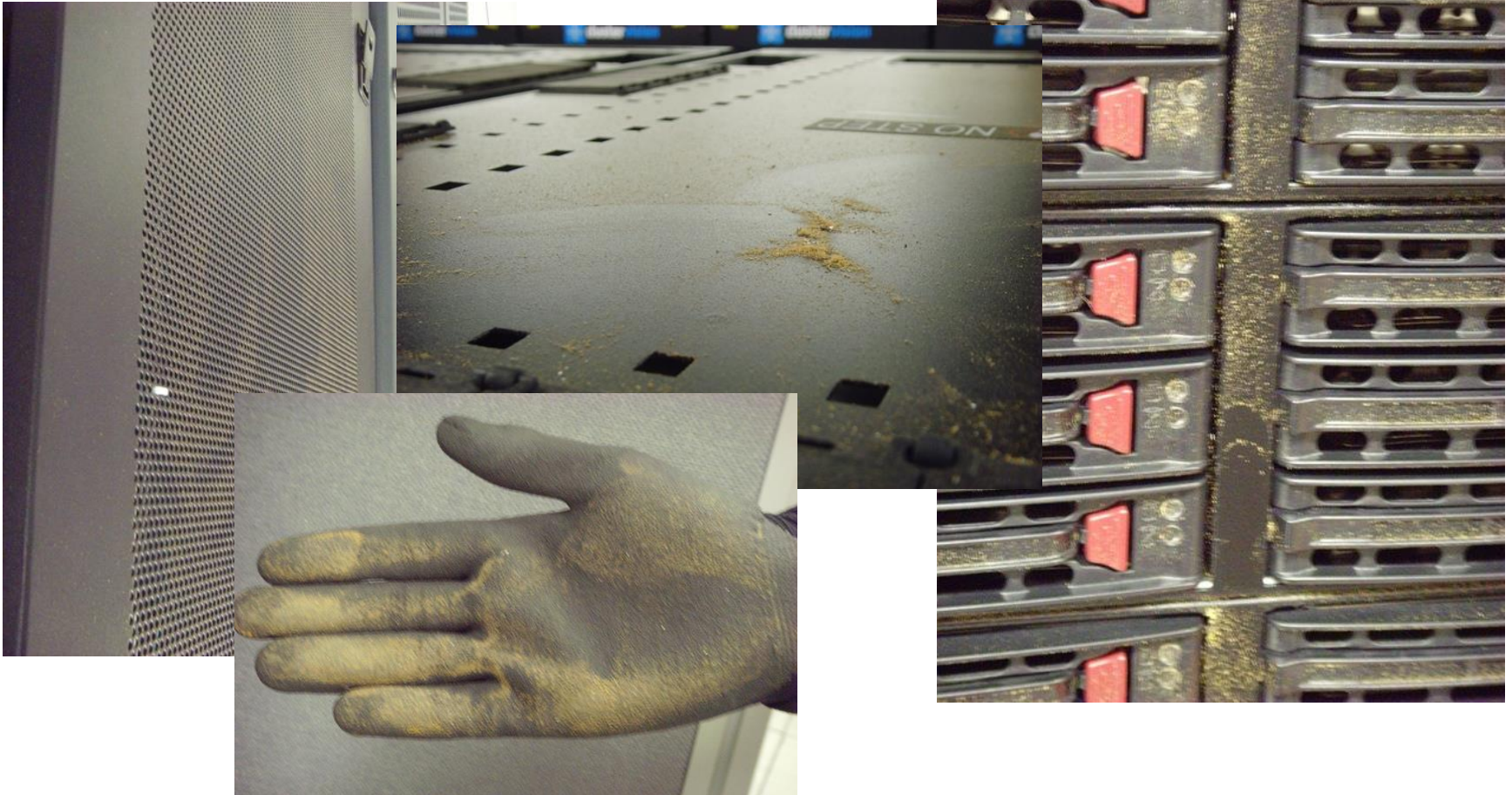
- Pipe lagging on the chiller water ring mains coming off
- Orange dust contamination in the room
- Health & Safety issues

Solution

- Access limited to HPD. Masks must be worn
- Replaced ALL the lagging
- Underfloor/overhead cleaning implemented and CRAC filters replaced
- Routine checks on the lagging



HPD Dust Contamination





July 2010

Transformer TX2 tripped

Effect

- Loss of power to racks and CRACs fed from E circuit

Solution

- Transformers cross-linked (dual) so power switched to another transformer. *Manual switched over*
- Fault identified to Restricted Earth Leakage. Changed the error rate



December 2010

Distribution Board over-heated

Effect

- Burning smell from Distribution Board (DB)
- Temperature reading @ 105 °c

Solution

- Emergency shutdown of the DB
- Fault with Active Filter within the DB. Switched off Active Filter and switched DB back on
- Temperature sensors installed in all DBs. Notification via Pager/SMS



Year 2011



Fault-free year



November 2012 RAL Power Cut

Effect

- Site-wide power cut across RAL
- Loss of power to R89 Data Centre
- R89 Generator tripped
- UPS shutdown

Solution

- Generator fault with Restricted Earth @ mechanical board end
- UPS monitoring software deployed
- Console room and Operations room on UPS feed
- R89 Lights on UPS feed. Health & Safety issue.



November 2012

Planned Essential board upgrade

Effect

- Upgrade Essential board from 400amp to 630amp
- New DX dual CRACs installed in LPD Computer room
- Temporary supply to UPS feed installed to avoid downtime
- Move BMS panel to Essential Board
- Only UPS feed @ risk

At Fault

- Engineers forgot to reconnect the neutral conductors
- Power surge to UPS feed
- Damage in excess of £250K



November 2012 Generator Test

Effect

- Generator failed to start
- UPS Computer room on UPS feed with NO power!
- Bus-coupler failed to close when fuse put back in

Solution

- Bus-coupler manually switched in and normal power restored
- Fault identified to faulty battery in the transformer. Could have been as a result of the power cut in early November
- All internal batteries removed from the transformers and now powered from central source. All batteries now monitored
- Generator Testing regularly – On-load every quarterly and Off-load monthly



Faulty Transformer batteries





November 2013

Planned Essential Board upgrade

2nd attempt

Effect

- Upgrade Essential board from 400amp to 630amp
- New DX dual CRACs installed in LPD Computer room
- Move BMS panel to Essential Board
- Only UPS feed @ risk
- Included Electrical Testing of UPS circuits (Electricity at Works Regulations)

Solution

- Change Management / committee to review the work flow/risks
- Permanent non-UPS supply installed to provide extra resilience
- Temporary power to CRACS in the UPS room
- Dual power supply servers switched to non-UPS to avoid downtime
- Everyone debrief of the tasks
- Better risk management processes



2014

Summary

- Reviewed Preventive Maintenance Plans
- Developed schedules/cycles on what required maintenances
- Invoked quarterly testing of the Generator/UPS *on-Load*
- Routine checks of the lagging and underfloor pipework's implemented
- PC0Webs cards installed in CRACS/Chillers and monitored by Nagios and BMS system
- Better understanding of the HVAC system and cross training
- Working together – Estates department and Computer Operations
- Directors understand to core business need of R89 Data Centre



February 2015

Electrical Testing of HPD / LPD Computer Rooms

Effect

- Electrical Testing of all non-UPS circuits (Electricity at Works Regulations)
- Testing of Distribution Board (DBs) x 11 in the HPD/LPD
- Circuit testing under floor

Problems

- Some circuits incorrectly labelled.
- Rack PDUs overloaded

Solution

- Change Management / committee to review the work flow/risks
- Detailed planning on what DB should be tested to avoid downtime
- Everyone debrief of the tasks
- Better risk management processes
- Reviewed circuit labelling and processes in place.



Question time?

