USAF Dehumidification Efforts for Corrosion Control

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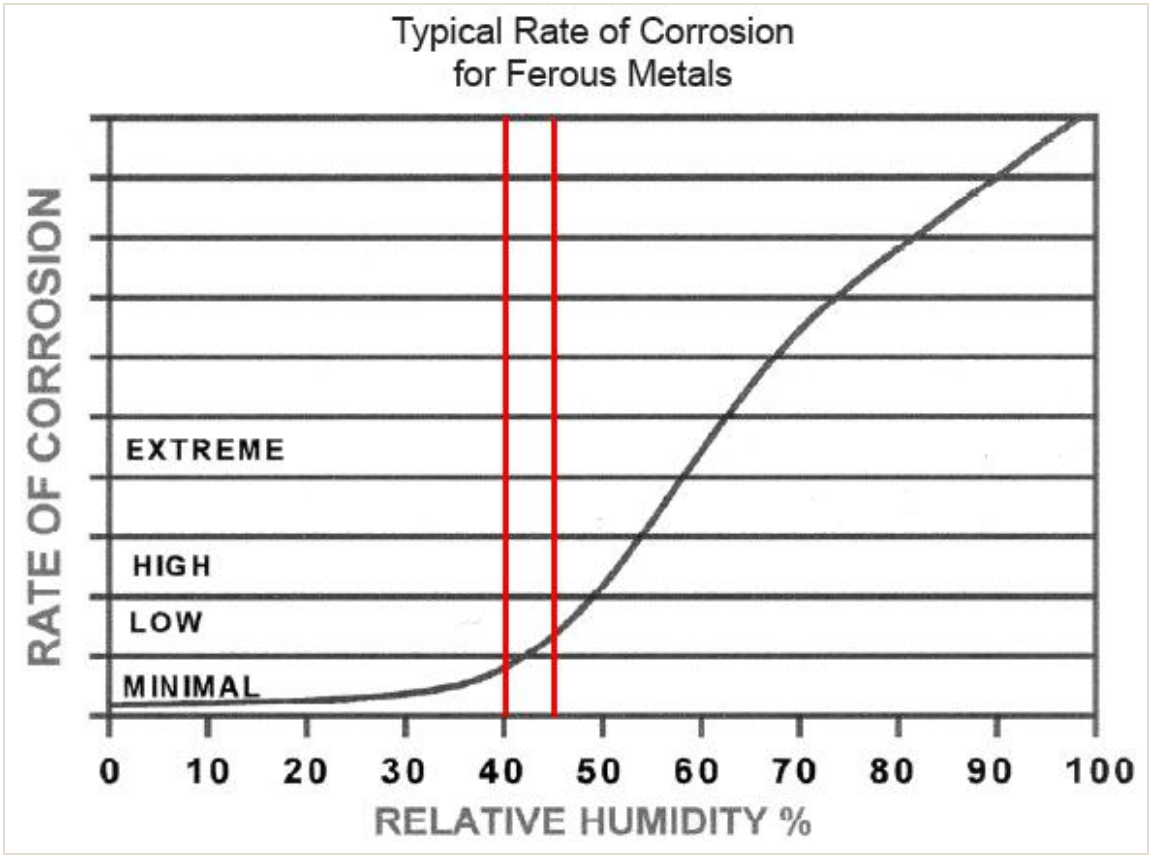
Overview

- Fundamental Corrosion Control
- Why DH
- DH Concept
- Current DH Efforts
- Green Shelter
- Control Humidity Protection Shelters
- DH Evaluations
- AFCPCO goals

Fundamental Corrosion Control

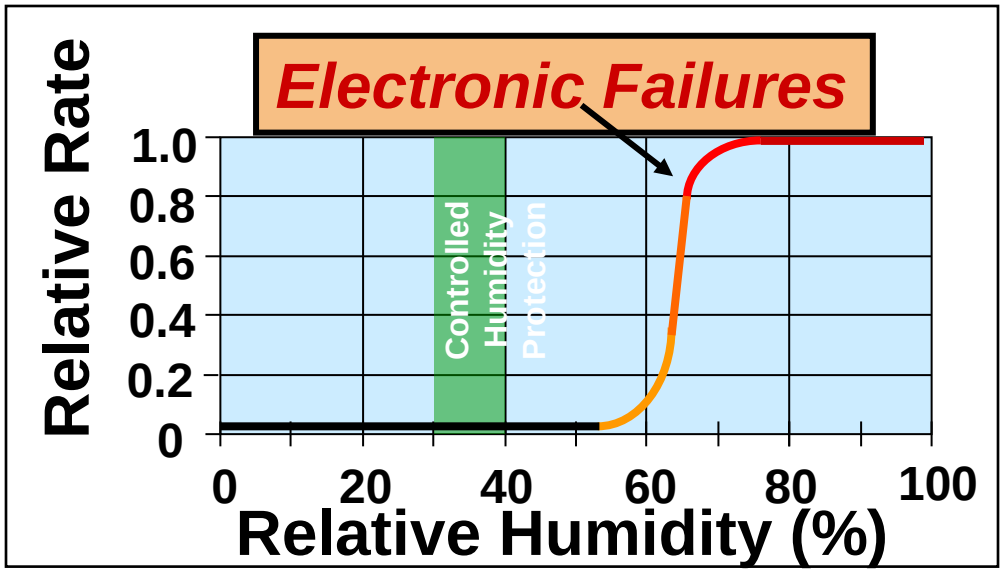
- **Corrosion Conditions**
  - Anode
  - Cathode
  - Electrolyte
  - Electrical Contact
- **Humidity vs. Corrosion**
  - Corrosion rate increases exponentially above 50% RH
  - Typical control range: 30-50% RH
  - Anything below 30% could lead to static charge buildup



CONCEPT: BREAK THE CORROSION CIRCUIT BY REMOVING THE CONDUCTIVE ELECTROLYTE

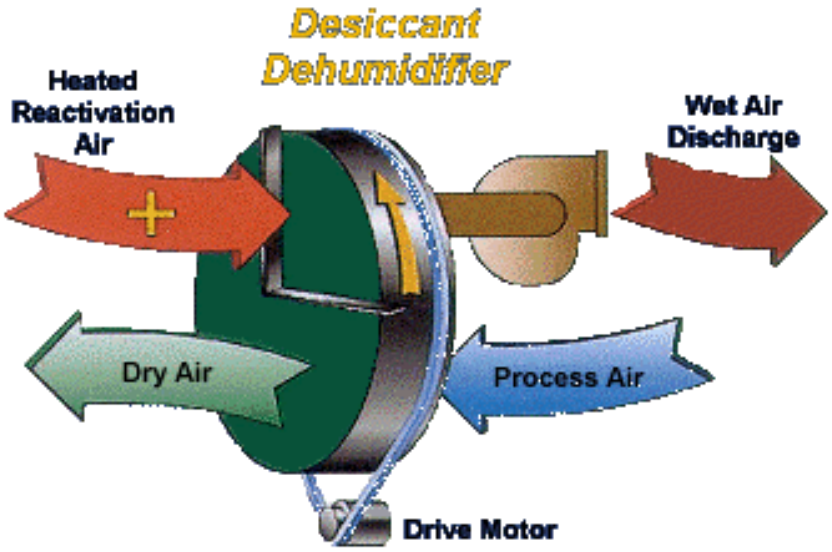
Why DH

- **15%- 20% electronic failures due to moisture induced corrosion**
- **DH most effective method to protect equipment from corrosion**
- **Seen 9 to 1 ROI**
  - Reduced maintenance costs
  - Improved reliability



DH Concept

- Dehumidification (DH) can be achieved by:
  - Cooling - vapor condensation
  - Heating - air expansion
  - Desiccants - materials with high affinity for water
  - Combination thereof
- Air Dehydration Units
  - Uses a self rejuvenating desiccant wheel dehumidifier
  - Closed or open loop
- DH can be Sheltered or Unsheltered



Current DH Efforts

- **Unsheltered Controlled Humidity Protection**
  - Uses mobile DH units
  - Reduces moisture derogation of avionics and electronic systems

- **Current CHP efforts**
  - KC-135, Hickam AFB, HI
  - F-16, McEntire ANG, SC
  - C-130, McEntire ANG, SC
  - F-22, Tyndall AFB, FL

Current DH Efforts

- **General Location of Most LRU's Dehumidified**

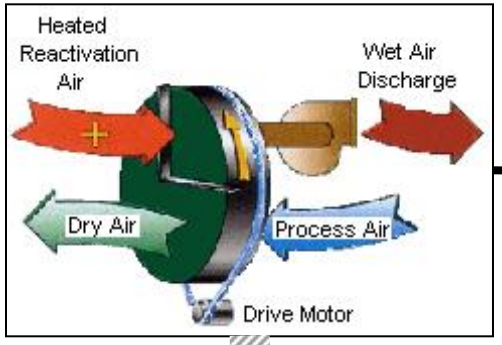
Current DH Efforts

Current DH Efforts

- **Sheltered Controlled Humidity Protection**
  - Climate controlled
  - For aircraft and AGE
- **Current efforts**
  - AGE, Savannah ANG, GA
    - AFCPCO Green Shelter test
  - AGE, Hickam AFB, HI
- **Future Shelter efforts**
  - F-22, Hickam AFB, HI
  - Kadena AB, Japan

The Green Shelter

Dehumidification Unit



Renewable energy powers dehumidification equipment (DH)

LED lighting also powered by renewable energy

Booth contained in maintenance shelter for added corrosion protection and a comfortable working environment

Soft Wall Maintenance Shelter

Retractable Sealed Booth

Stored AGE

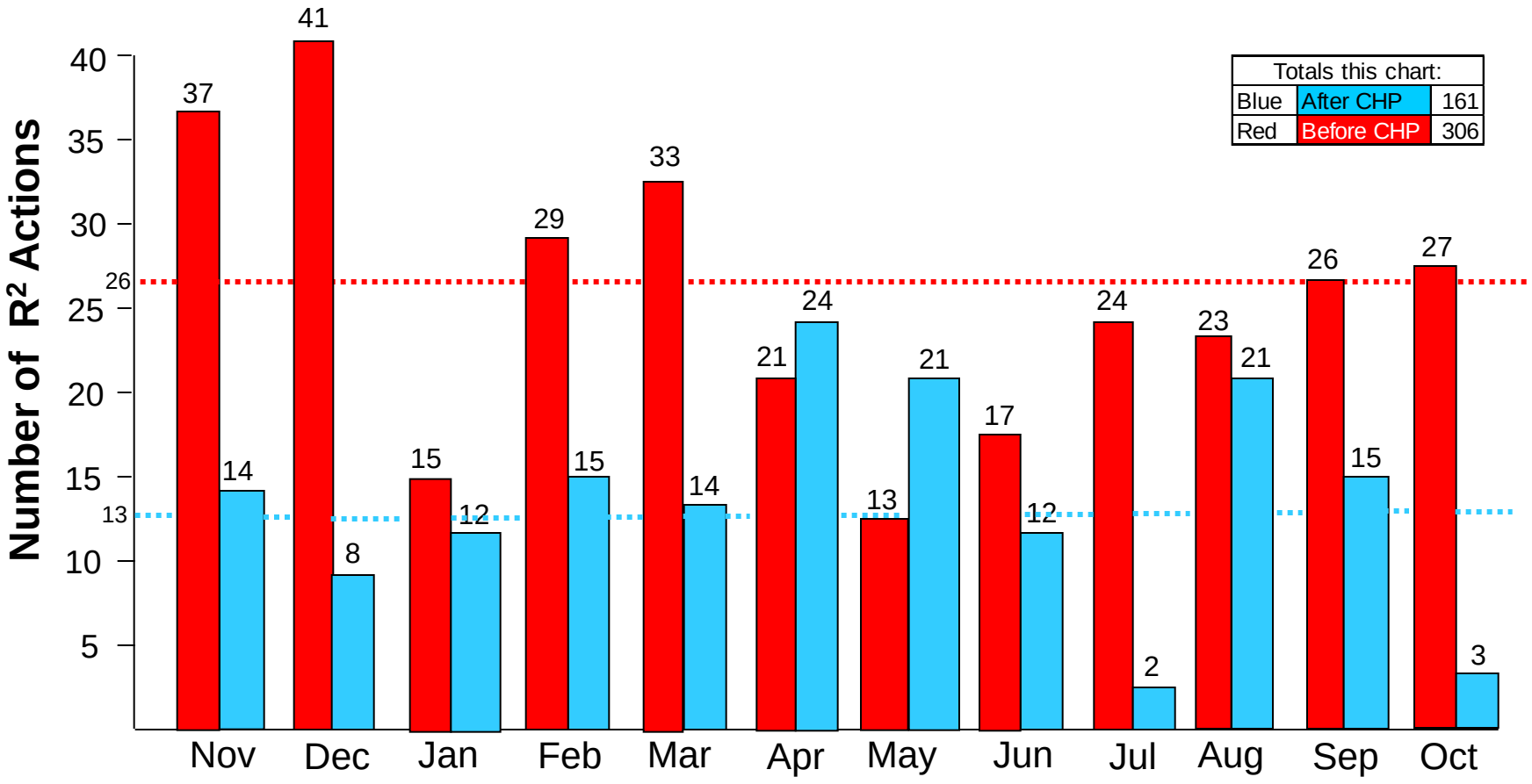
DH maintains dry air in storage booths, protecting AGE equipment from corrosion and moisture infiltration

CHP Shelters

- **Used to prevent corrosion on outer skin**
- **Being developed for the F-22 at Hickam AFB**
- **Pre-Engineered Steel Structure designed specifically for DH**

DH Evaluation

F-15A/B LRU Remove & Replace (R^2) Comparison:
R^2 Actions Reduced by 47% After CHP

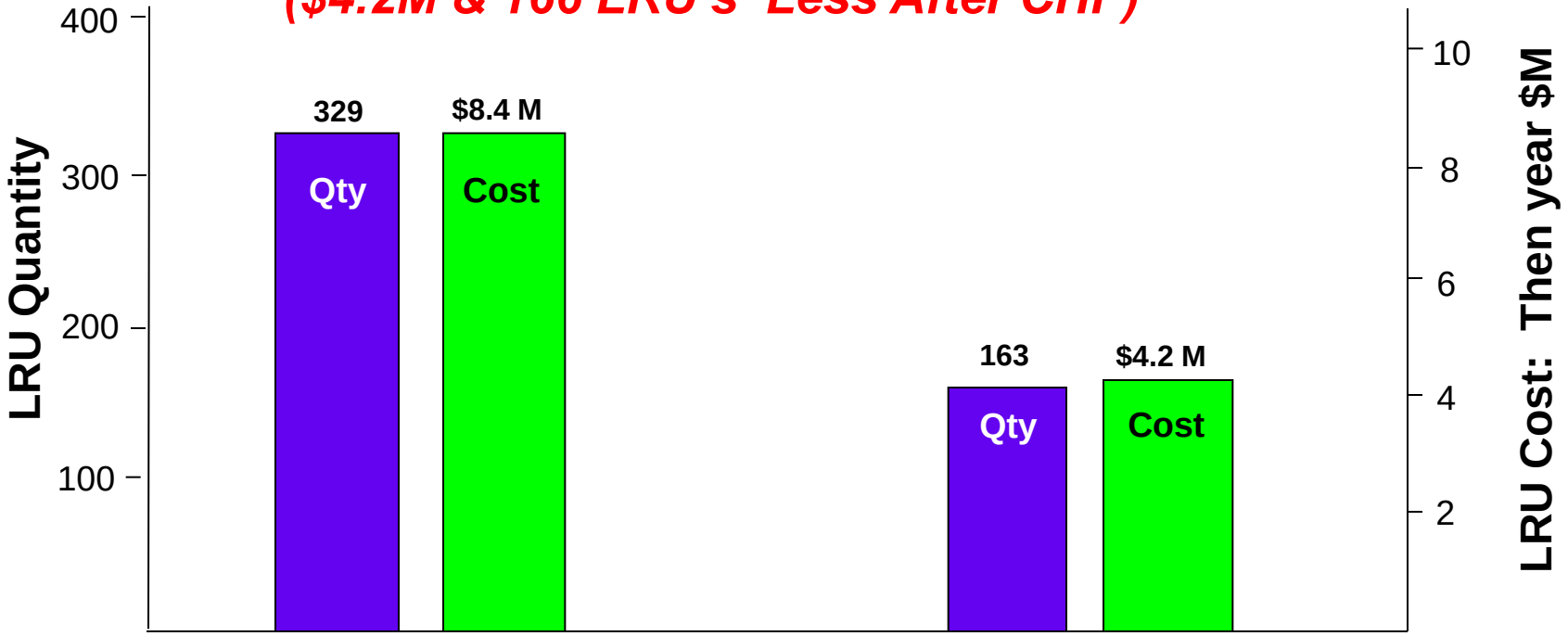


DH Evaluation

F-15 A/B LRU Cost & Quantity Comparison After 12 Months

16 CHP Slots
Used avg
47% of time
for all A/B/C/D
model F-15s

Issue Costs and Quantities 50 % Less After CHP
($4.2M & 166 LRU's Less After CHP)



Before CHP
Nov 05 thru Oct 06
Average possessed acft: 19

After CHP
Nov 06 thru Oct 07
Average possessed acft: 14

DH Evaluations

Service	Timeframe	Equipment	Results
RAF	2000s	Tornados	24% decrease in “no fault” discrepancies 15% decrease in avionics maintenance
US Navy	1993	EP-3 Aries	Avionics reliability improved 25% Increased MTBF 7-30%
US Navy	1995	A-6E Intruder	Increased MTBF 21%
US Army	1997-1998	UH-60 Blackhawk	Savings of $2.2 million

DH Evaluations

Service	Timeframe	Equipment	Results
USAF	2006	KC-135, Hickam	TBD
USAF	2006	F-15, Hickam	R2 actions reduced by 47% Labor hours reduced by 31% monthly
USAF	2008	F-16, McEntire	TBD
USAF (AFCPCO)	2009	AGE, Savannah	50% Decrease in corrosion from sealed booth to shelter 50% Decrease in corrosion from shelter to outside
USAF	2011	F-22, Tyndall	TBD

AFCPCO goals

- **Condition-based maintenance (CBM+)**
  - High Velocity Maintenance (C-130)
  - Maintenance Steering Group (MSG-3)
- **New DH chapter in TOs**
  - 1-1-691
  - 35-1-3
  - -23
- **Expeditionary Combat Support System (ECSS)**

Summary

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Questions

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