



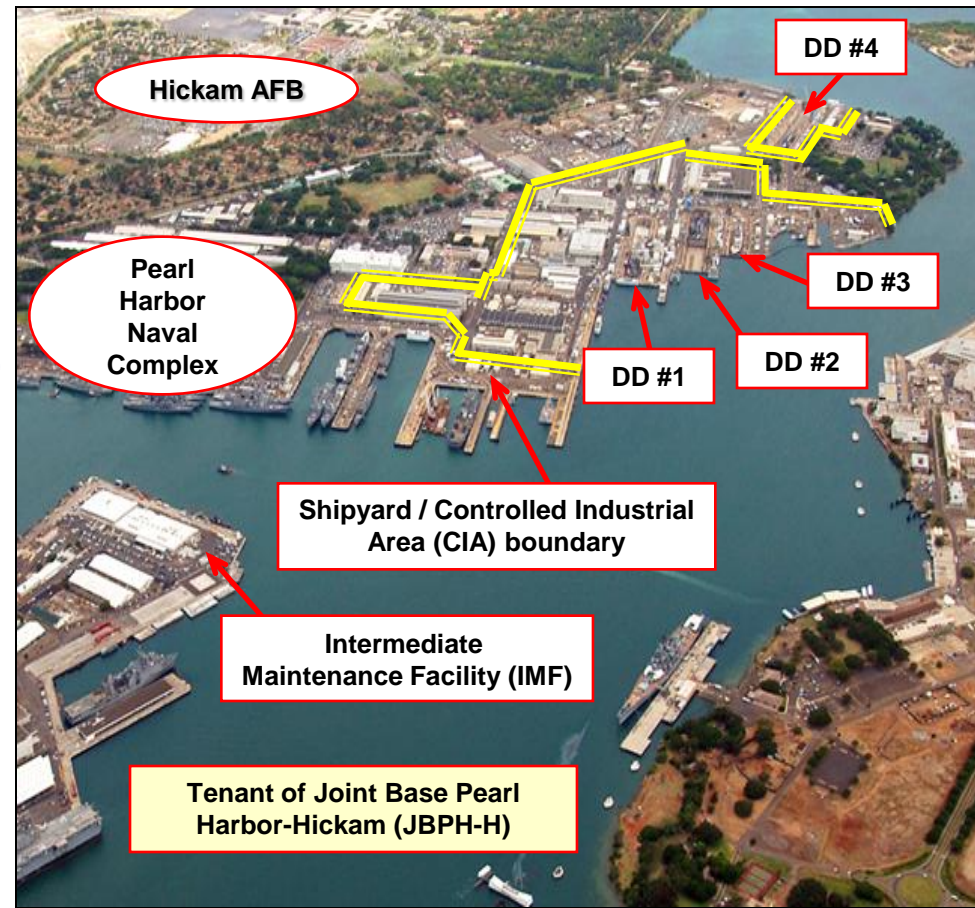
Pearl Harbor Naval Shipyard

Randy Sawyer
Executive Director



WHO WE ARE

- **Largest Naval Facility in Hawaii**
 ... Largest ship repair facility between U.S. West Coast and Far East
- **Largest industrial employer in Hawaii**
 ... 4,396 Civilian and 454 Military personnel
 ... Largest employer of engineers in Hawaii
- **FY09 Goods & Salary: \$687M**
- **Plant Value: \$2.1B**
- **Approximately 148 acres**
- **176 buildings**
- **38 structures** (*piers, wharves, drydocks, etc.*)
- **'One Stop' Regional Maintenance Center (RMC)**
- **'Joint Base' tenant**
- **Product Lines:**
 - 90% Submarines
 - 10% Surface Ships



PRODUCT LINES & SERVICES



20 Submarines (>90% of workload)

- LOS ANGELES and VIRGINIA Class SSN's
- 17 Homeported at Pearl Harbor
- 3 Homeported at Guam

11 Surface Combatants (<10% of workload)



Product Lines

- Fleet Maintenance
- CNO Maintenance
- Prep for VIRGINIA Class (unfunded)

Services

- Technical Assistance
- Training
- Emergency Response

WE STILL KEEP THEM 'FIT TO FIGHT'

- 7 Dec 1941: Returned 15 of 18 damaged ships to full service
- During WWII: PH Navy Yard completed 7,000 ship repairs

1942 - USS YORKTOWN Repair



July 14, 2000

USS DENVER LPD-9

2007 - USS NEWPORT NEWS Repair

2000 - USS DENVER Repair



July 27, 2000

2009 - USS HARTFORD Repair

2005 USS SAN FRANCISCO Repair

2001 - USS GREENEVILLE Repair



EMERGENT DOCKINGS:

- Submarines & surface ships
- Commercial vessels

RIM OF THE PACIFIC EXERCISE:

- Bi-annual requirements



2009 - USS PORT ROYAL Repair



Significant Maintenance Challenge

Bio-fouling of Ship Sea Water Systems

- **Rapid sea growth due to marine rich environment and warm sea temperature**
- **Directly affects system operation and efficiency - water flow and heat transfer degradation**
- **Requires routine and costly preventive and corrective maintenance**
- **Preventive Maintenance**
 - **Electro-Chlorination**
 - **Environmental discharge limits apply:**
 - 0.1 ppm chlorine injection require no discharge treatment
 - 0.3 ppm chlorine injection requires de-chlorination discharge treatment
 - For both concentrations:
 - Can only run 2-hrs/day
 - Requires sampling and testing at every run to ensure 0.0-0.1 ppm discharge limits are not exceeded
 - Have minimal effect on reducing sea growth

Significant Maintenance Challenge

Bio-fouling of Ship Sea Water Systems

- **Corrective Maintenance**
 - Hydro-lance cleaning of heat exchangers and condenser tubes
 - ~6,000 tubes (20' length) in a submarine main condenser
 - Requires water pressures of 5,000 psi
 - Acid Flush
 - Generates ~35,000 gallons of hazardous waste requiring special handling and treatment
 - Results in pitting and advanced wear of system components and piping
 - Certain systems limit the number of acid flushes that can be accomplished

Possible R&D Solutions

Bio-fouling of Ship Sea Water Systems

- **Ultraviolet (UV) Light**
 - Would need to be capable of killing micro-organisms in a large, single pass, high-flow environment
 - Could integrate use of “kill” sensors and flow rates to govern light wattage
- **Nano-Film Deposition**
 - Develop a nano-substance that could be plated or internally deposited on internal system surfaces that would inhibit the attachment and/or growth of micro-organisms
 - Ideally, the nano-film would be tightly adherent, have great wear properties, not interfere with system operation, be heat resistant, and environmentally friendly

Possible R&D Solutions

Bio-fouling of Ship Sea Water Systems

- **Ultrasound Wave Emissions**
 - Develop an approach to sonically disrupt micro-organism adhesion
- **Impressed current sacrificial copper or aluminum anodes**
 - Introduction of copper or aluminum ions into the water that inhibits micro-organisms from attaching to surfaces.
 - Analyze applicability for use in naval submarines
- **Automated cleaning of main condenser tubes**

Other Possible R&D Solutions

Develop an alternative to fiberglass pipe lagging

- Ideally, material would be thermally efficient, heat and wear resistant, non-hazardous, and would not require painting or other preservation upkeep

Develop a portable laser cutting machine

- Ideally, the machine could follow any contour, cut various types of metals (e.g., stainless steel, inconel, monel, titanium, and aluminum) to desired depths up to an accuracy of 0.0005", and incorporate a flexible scope (fiber optics) for tight areas

Develop a method for laser straightening of Virginia Class submarine shafts

- Currently, no means is available to straighten shafts when they become distorted. It is anticipated that laser straightening can be a controlled method that can be modeled to produce predictable results

Other Possible R&D Solutions

Develop a method for Eddy Current testing of HY100 welds

- **Current ET methods can't detect transverse cracking in the body of HY100 welds**
- **Current process involves removing paint and performing Magnetic Particle inspections, which is costly and time consuming**

