Lighting Applications
Success Stories from Paramount Industries

T5 FLUORESCENT TECHNOLOGY FLIES HIGH FOR DEFENSE

The United States Air Force stands on the front line of America's defense around the world. It's a tough job that requires tough equipment, even for lighting. Paramount Industries made the grade by updating jet fighter shelters with new T5 fluorescent technology.

On Guard In Japan

Misawa Air Base is the Air Force's northernmost facility in Japan. The base is located in the northeast portion of the main Japanese island of Honshu, approximately 400 miles north of Tokyo. The surrounding area is mostly rural and quite scenic.

Stationed at Misawa is the USAF 35th Fighter Wing. Its mission is to "help defend Japan and promote regional security in the Pacific by providing forward presence, deployable forces, and quality mission support." Throughout a five-decade history, the 35th has received major unit awards and citations. It played a key role in Desert Storm's successful air campaign by flying over 3,000 combat missions. Misawa is also the only combined joint service installation in the Western Pacific. The 35th serves as host to a variety of associate units representing all four U.S. military services. Japanese Air Self Defense Forces also utilize the base.

The wing flies two squadrons of F-16 Fighting Falcons. These high-tech war machines are housed in hardened aircraft shelters, abbreviated HAS. This type of structure has some stiff lighting requirements, because the power of the jet engines generates such great vibrations even in a building that's made of several inches thick concrete poured over 2 inch thick steel. The presence of hazardous materials and explosives also add to the concern.

New Lighting Required

The 35th fighter wing decided to investigate new lighting for the aircraft shelters because current lighting levels were ineffective and caused a huge safety concern for maintenance personnel. There was also interest in cutting energy consumption on base.

Captain Elizabeth Porter, Chief of Maintenance Engineering, accepted the responsibility to head this project. Her office is responsible for all base infrastructure and manages the energy program. She was assisted by Resource Efficiency Manager Mr. William Bunch of Tetra Tech EMI.

Original lighting in the hardened shelters was 400W High Pressure Sodium High-bays. This offered marginal light levels (20 footcandles) of yellowish light with poor color rendering, making it difficult to service the multi-million dollar fighter jets. Local Japanese engineers who work with the Misawa staff recommended swapping Metal Halide for the HPS. This certainly made the spaces brighter, but actually used more electrical power.

The Air Force contracted energy consultant Bart Wallace, president of Daystar Energy Systems in El Cerrito, California, to help them deploy the proper lighting system. He suspected that the advantages of new T5HO fluorescent lighting technology might offer the light levels, color rendering and energy efficiency that the military branch was seeking. "But this was pretty radical because the Japanese were not familiar with T5HO. The new fluorescent technology has not been accepted as quickly in Japan as it has in Europe and North America."

continued

To demonstrate the lumen value and color of a T5 solution, Bart created a concept test sample using an off-the-shelf luminaire moved between gyms, warehouses and other large volume facilities on base and in Misawa City. The test was performed using an American-made 4 lamp open luminaire with a specular reflector.

However, new HAS lighting would require enclosed luminaires, carrying a UL Class I, Division 2 hazardous location classification. To develop product specifications for this project, Bart turned to Darrell Packard of Associated Lighting Reps in Oakland, California.

Paramount Steps Forward

Darrell suggested Paramount Industries, of Croswell, MI because of their experience with custom designs, and their manufacturing capabilities for heavy-duty industrial luminaires, as well as their quick delivery. "Nobody else could offer a UL Listed multi-lamp hazardous location troffer."

Paramount utilized eight 54-watt T5HO lamps and a specular reflector in their hazardous location HS2 model Techniseal® troffer to create a new 2x4 luminaire. With eight lamps, it delivers up to 40% more mean lumens than a standard 400-watt metal halide luminaire. Even with only six lamps, it can still provide equivalent light levels while yielding up to 25% energy reduction (according to ballast manufacturers' statements). Other advantages over metal halide include instant start up, better lumen maintenance and excellent color rendering. It also offers the opportunity to interface with electronic controls for additional energy savings.

Physically, a prismatic acrylic lens on the luminaire helps to distribute light more evenly, reducing the harsh, contrasty shadows generated by the original "point of light" HPS luminaires. The luminaire also has a 6.5" high profile, while many HID luminaires require a minimum 12" depth.

One key issue was the 200V/50Hz Japanese electrical system. Switching to an alternative universal voltage ballast eliminated the problem and added end-of-life sensing. Another issue was mounting, since these units would replace high-bays in an arched ceiling situation. But Paramount's customizing capabilities made it easy to develop a mounting bracket that could be utilized with the existing structures.

The Air Force and local Japanese engineers reviewed drawings and product samples for six months before reaching a consensus. They opted for the six lamp version. 765 of the new luminaires were ordered for the 31 shelters on base.

Japanese contractors, working for SABER (Simplified Acquisition Base Engineer Requirements), began installing the new *Techniseal* luminaires in March 2004. By July, 50% of the shelters were changed over. The project is scheduled to complete by December. Installation has been staggered among the buildings to keep disruption of defense work to a minimum.

Twenty-four units were installed in each 8,758 sq. ft. shelter. The HAS ceilings were also cleaned and painted white. The luminaires were mounted with a 20 x 18 ft. spacing layout. Because of the curved ceilings, mounting heights varied from 17 to 25 ft.

Capt. Porter also ordered 255 of Paramount's three lamp hazardous location HT5 model Paramyd® luminaires for task lighting. These will be installed later at floor level to provide extra light underneath the aircraft. Four of these will be mounted along each side of the shelters and two by the back door. The *Paramyd* luminaire is an extremely rugged vibration-resistant luminaire with adjustable mounting brackets and a tool-free lens frame for easy servicing.

Mission Complete: A Success

After the installation, all the involved parties were impressed. "All customers that I have talked to say the difference is 'night and day.' I've heard nothing but good things about these lights," said Capt. Porter.

New light levels averaged 50 footcandles in the first shelter. This was more than double the levels of the original HPS, but because of the whiter light and better color rendering it gave the visual impression of being even brighter. This will increase productivity for the military technicians working in the shelters. Master Sergeant Brohal reported "All the distracting shadows have disappeared and colors are more true. I feel we can do our job safer under this new white light."

Even with the dramatic improvement in light quality, the base energy consumption was reduced. Capt. Porter commented "They don't care that I'm saving 25% in energy, all they know is that they can see and they can do their job safely."

Paramount lighting is deployed at a number of US military bases. Since this experiment with T5HO lighting technology satisfied the initial lumen value, color rendition and energy demands of the USAF and local engineers, Paramount's HS2 series could become a model for USAF aircraft shelters around the world.

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