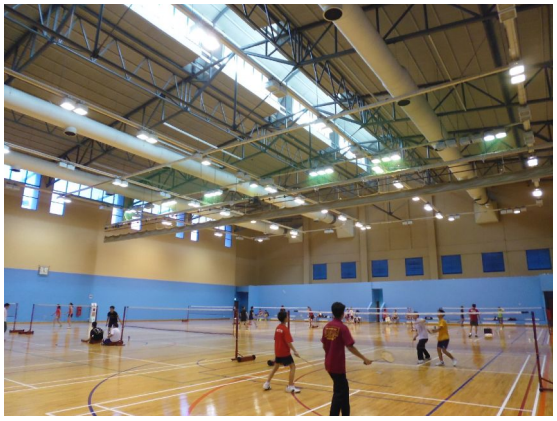
Indoor badminton court lightings

Replacement of 400W metal halide floodlight by high intensity LED luminaires

Case Outline



An indoor stadium with covered area of 870m^2 was opened for public recreation and training since early 2000. The premises provides 162 units of 400W metal halide floodlights mounted on the structural beams at the height of 10 meters illuminating 6 standard badminton courts.

The stadium is operating 14 hours daily throughout the year with an occupancy rate of 75% or thereabout. The power consumption was estimated to an average of 310400kWh annually. Provision for cost of maintenance for replacement of light bulbs was budgeted for $20,000 to $25,000 per annum mainly covering the expenses for hiring of scaffolding and labours. The annual operation cost is therefore estimated for a total of not less than $100,000 or approximately $280.00 daily.

For the purposes of cost saving, we were invited to provide a scenario for transformation of the existing lighting system. Our task is to providing a solution for minimizing the operation cost by replacement of LED luminaire with rational capital outlay and quick payback.

Facts finding

The following facts were found during the physical site survey:

- The atmospheric room temperature was maintained at the level of 25~26°C;
- Lighting fixtures are mainly fitted with 400W metal halide bulbs;
- The color temperature of light bulbs are cool white (3900~4000K);
- Light bulbs were generally replaced twice a years;
- The average luminous flux on floor level was 265 lux;

Solutions

162 units of 30W FL3220 high intensity LED floodlight were recommended for replacement of the existing 400W metal halide fixture basing on the following criterions:

FIG. 1: 30W FL3220 LED Floodlight

- Lightings classification: Compliances with Class III of EN12193-2007.
- Illumination on floor level: ≥400 lux (E_{av});
- Uniformity: 0.5~0.6 (u0).
- Glaring index: UGR ≤25
- Lighting profile: Same as the existing lighting installation plan including mounting height.
- Correlated color temperature (CCT): 4000~4500K.
- Beam angle of luminaire: 30 degree.
- Color rendering: >80.
- Environmental impact: Not applicable as the stadium located within the premises of a sport complex is facilitated for training and recreation purposes.

Project Results

- Total illumination area: 870.24m^2 (see FIG. 2);
- Lighting profile: 162 units of 30W FL3220 (see red dots in FIG. 2);
- Total luminous of luminaire: 575897 lumen;
- Mounting height: 10 meters from ground level;
- Average luminous flux on ground level (E_{av}): 467 lux;
- Uniformity (u0): 0.549
- Power consumption per luminaire: 32.2W (system power);
- Total power consumption: 5.216KW;
- Power consumption before replacement: 310433kWh per annum;
- Power consumption after replacement: 39213kWh per annum;
- Power saving per annum: 271220kW per annum;
- Estimated cost saving: $74,503 per annum (@ tariff rate of $0.24/kWh);
- Estimated payback period: approximately 12 months (inclusive of cost of luminaire and installation).

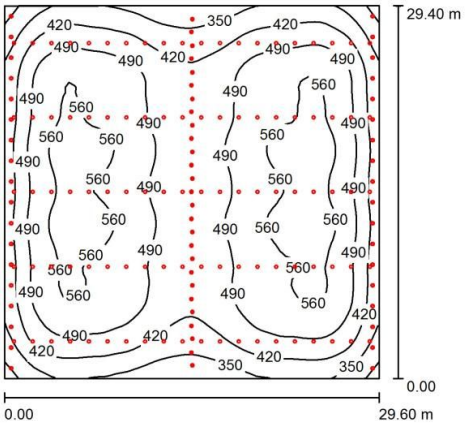


FIG. 2: Isoline on ground level

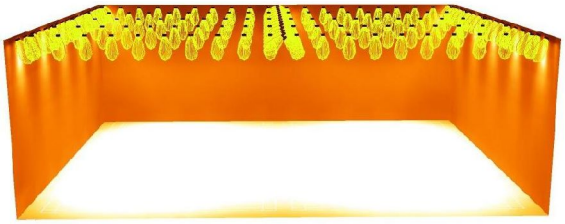


FIG. 3: Color Rendering