Table 1: ASHRAE thermal sensation scale of PMV

|  |  |  |  |
| --- | --- | --- | --- |
| **PMV** | **Sensation** | **PMV** | **Sensation** |
| -1 | Slightly Cool | +1 | Slightly Warm |
| -2 | Cool | +2 | Warm |
| -3 | Cold | +3 | Hot |

|  |  |
| --- | --- |
|  |  |

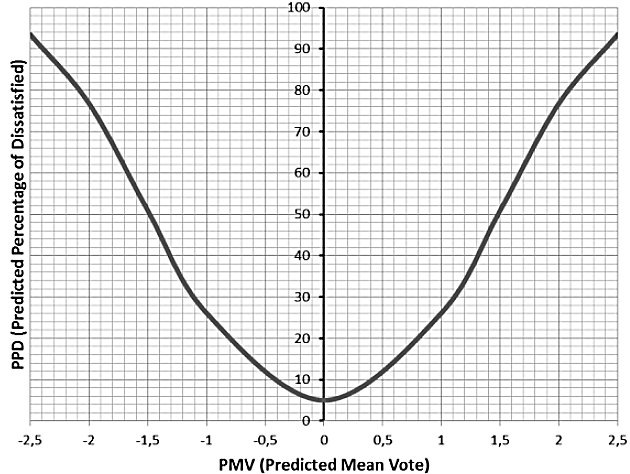


Figure 1: Relationship between PMV and PPD [15]

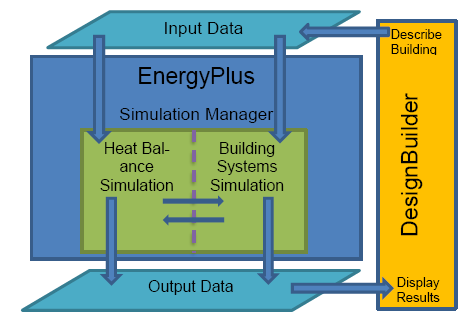


Figure 2: Relationship between “EnergyPlus” and “DesignBuilder”

Interface System

(Fuzzy)

(Fuzzy)

Outputs

Inputs

De-Fuzzifier

Fuzzifier

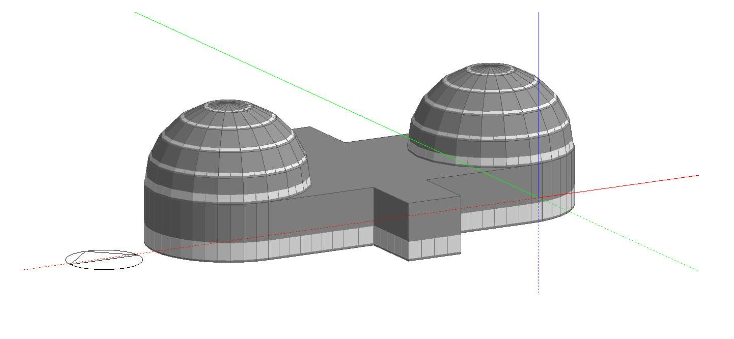
Interface system

Base Rule

Figure 3: Configuration of the Fuzzy system

Table 2: Energy consumption for Terminal-1 of Sharm-Elsheikh airport

|  |  |
| --- | --- |
| **Load** | **Consumption %** |
| HVAC | 70.5% |
| Lighting | 6.5% |
| Hot water | 1.4% |
| Motors and miscellaneous | 21.6% |



**Figure 4:** 3D Modeling of Sharm-Elsheikh Terminal-1 building

Figure 5: Comparing BMS & FLC in saving lighting consumption for Terminal-1 of Sharm-Elsheikh airport

Figure 6: Comparing BMS & FLC in saving HVAC consumption for Terminal-1 of Sharm-Elsheikh airport

Figure 7: Comparing BMS & FLC in saving total energy consumption for Terminal-1 of Sharm-Elsheikh airport

Figure 8: PMV comparison between BMS & FLC for Terminal-1 of Sharm-Elshiekh airport

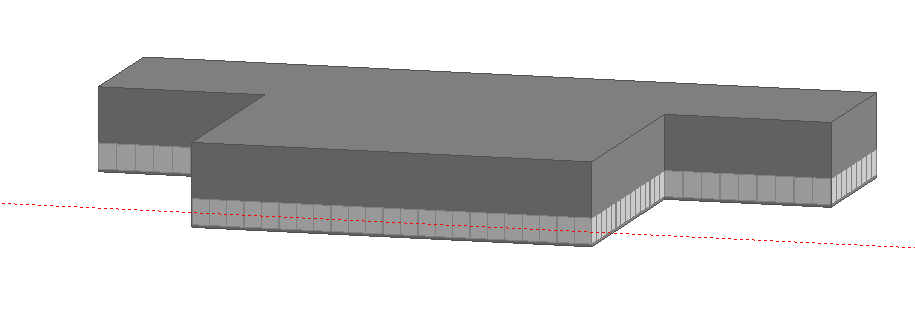


Figure 9: 3D Modeling of Luxor Terminal building

Figure 10: Comparing BMS and FLC in saving lighting consumption for Luxor airport

Figure 11: Comparing BMS and FLC in saving HVAC consumption for Luxor airport

Figure 12: Comparing BMS and FLC in saving total energy for Luxor airport

Figure 13: PMV comparison between BMS & FLC for Luxor airport

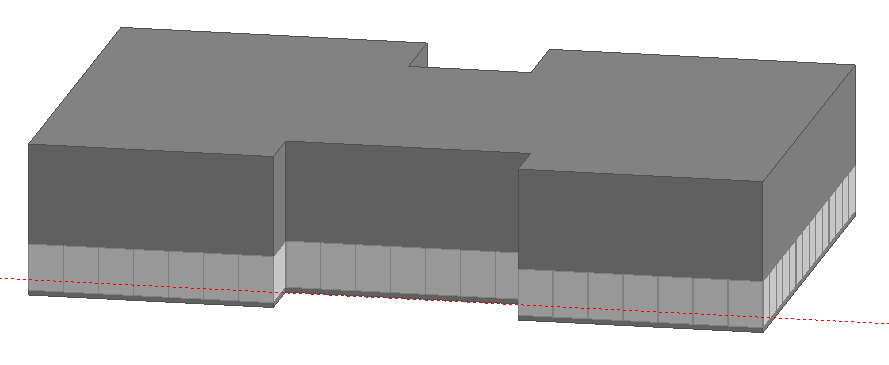


Figure 14: 3D modeling of Taba airport

Figure 15: Comparing ON/OFF controller and FLC in saving lighting consumption for Taba airport

Figure 16: Comparing ON/OFF controller and FLC in saving HVAC consumption for Taba airport

Figure 17: Comparing ON/OFF controller and FLC in saving total energy consumption for Taba airport

Figure 18: PMV comparison between ON/OFF controller & FLC for Taba airport

Table 3: Achieved results for the three studied airports

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Sharm-Elshiekh**  **Airport** | **Luxor**  **Airport** | **Taba**  **Airport** |
| **Occupancy Level** | High | MED | Low |
| **Total Annual Energy Saving** | 20% | 17% | 13.5% |
| **Total Annual Emissions Avoided** | 18.75% | 14.9% | 13% |
| **PMV Achieved** | -0.12 : 0.8 | -0.21: 0.59 | -0.12:1.4 |