

ECO FRIENDLY RESORT FOR TOURISM – A CASE STUDY AT ULAGALLA RESORT

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Abstract: Tourism can be considered as an industry that can create considerable economic activity. However, tourism related activities can also contribute to a significant level of carbon emission due to electricity used for creating comfortable conditions. In tropical climates, air conditioning is considered as an essential item in tourist resorts. The resources used for construction and maintenance of resort also could have significant impact on the environment. Therefore, tourism can offer many opportunities for a greater degree of sustainability where innovative thinking and strategic use of new materials and systems could make a significant change.

1. Introduction

With significant number of tourists arriving in Sri Lanka, it can make some impact on the carbon foot print per person. At present, Sri Lanka is considered to have a very low carbon foot print per person, estimated to be only about 700 kg per annum. This compares very favourably with 2200 kg per annum in India or 5600 kg in China or about 24500 kg in USA [1]. Though, it is a significant achievement, maintaining such low values will be of a considerable challenge especially in view of rising electricity demand. For example, the carbon foot print of Sri Lanka is expected to increase up to 1100kg per person with commissioning of the proposed coal power plants. In this context, the promotion of the eco friendly resorts would be a promising idea. This paper addresses the creation of such a resort and various sustainable features included with respect to construction of buildings, energy efficiency, water efficiency and food production.

2. The Ulagalla Resort

Ulagalla resort is based on a large bungalow of over 100 years old of an extended family who used to hold significant positions in the government. It is located at Tirappane, 40 km north of Dambulla – Anuradhapura road. The property has an area of 58 acres. It borders two ancient reservoirs. The Ulagalla resort is a luxury boutique hotel that has utilized the bungalow as the reception/ lobby area, coffee lounge at lower level and a fine dining restaurant at the upper floor level. It also consists of 25 elegantly laid out luxurious Chalets spread over the 58 acres. Most of them overlook the reservoir while others overlook the paddy fields that also belong to the resort. This resort has many features purposely included to improve the utilization of sustainability concepts while ensuring a reduced carbon foot print.

Keeping with the “Go Green” concept of the owning company of the resort, 50% of the energy will be generated through solar power; the resort has the largest solar farm in the Sri Lanka at present with a capacity of 125 KVA. This has been coupled with the use of renewable materials for Chalets and various water and energy saving measures. In addition, a total of 1600 trees also have been planted to restore the natural habitat. Thus, it can be a good candidate for LEED certification [2].

3. The restoration of the adobe

One important principle of sustainable construction is repair and reuse of existing facilities. In this context, a decision was taken to completely restore the existing large adobe with minimum use of new materials. Figure 1 indicates the structure before restoration and Figure 2 indicates the fully restored building where careful attention has been placed to intricate details.



Figure 1: The bungalow prior to restoration

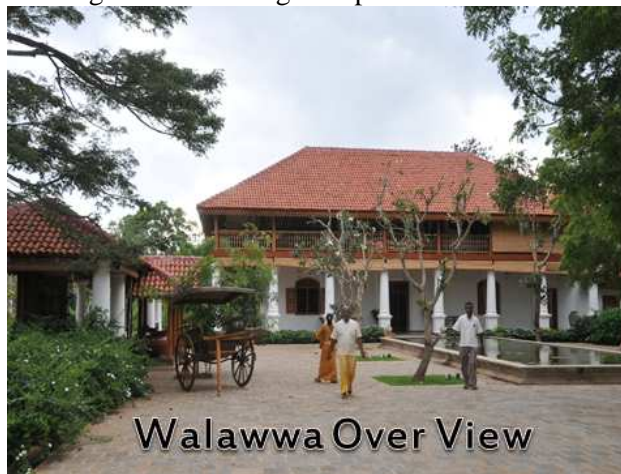


Figure 2: The bungalow after restoration

4. The Chalets

Each Chalet is of 80 m². This includes a separate dining area furnished with elegance and comfort combined with high end finishes and elegant architecture. Another special feature is the varandhas and the plunge pool. Each Chalet is designed so that they could be easily used by differently abled persons. Figures 3 and 4 indicate some details of Chalets.

The chalets have been provided with many useful features. The walls have been constructed with straw bonded solid panels called “Dura”. These walls with lower conductivity are expected to reduce the air conditioning load due to lower heat transmittance. The chalets are fitted with LED bulbs that reduce the carbon footprint of the resort by 80%. The AC system fitted into each chalet utilizes an environmentally friendly gas and the heat recovery system provides the entire requirement of hot water. Durra straw panels reduce the transmission of sound. It is also a 100% recyclable. It can provide a strong load bearing wall [3].



Figure 3: A view from the front side



Figure 4: A bedroom arranged with elegant features

Chalets include a separate living area. The chalets are furnished with elegance and refinement while combining state-of-the-art amenities. Each chalet also offers a tranquil courtyard and private plunge pool.

4.1 The elevated structure

One of the key features promoted with new construction under LEED certification is storm water quality control. In this context, a decision has been taken to minimize the earthwork by having the chalets as elevated houses constructed on columns. Although this almost eliminated the earthwork, a good solution was required with ground floor. The elevated ground floor was completed with straw bonded solid panels supported on a timber framework.

4.2 The roof

One of the main sources of inward flow of heat is solar radiation absorbed by the roof. In order to minimize this, a decision was taken to use thatch laid on the top of straw bonded solid panels as shown in Figure 5. The structural robustness of straw bonded solid panels gave a strong roof that would be able to withstand strong winds.



Figure 5: The chalet with thatch as roof covering

5. Renewable energy & rainwater Harvesting

One of the most important contributing factors to Ulagalla Resort's eco-friendly policy is the solar farm. It is the largest solar farm in Sri Lanka at present and supplies over 50% of the hotel's energy requirement when in full operation. The rain falling on solar panels could be directed to rain water harvesting tanks. This water could be used for various purposes including the maintenance of vegetation. Another view is given in Figure 7.



Figure 6: Solar panels arranged to facilitate rain water harvesting



Figure 7: Another view of the solar panel arrangement

6. The wastewater treatment

Another feature well recognized for LEED certification is waste water minimization and treatment. The fixtures have been provided with water efficiency features. In order to re-use the waste-water, a very efficient treatment plant has been installed. It is a Sequencing Batch reactor (SBR) type biological treatment plant that contain the following operations

- i. Equalizing
- ii. Filling
- iii. Aeration
- iv. Settling
- v. Decanting
- vi. Sludge Removal

This process can be illustrated as shown in Figure 8. The methodology is as follows:

- i. Raw sewerage, waste water & Laundry effluent will initially will gravitated to an underground Equalization tank
- ii. Effluent is then feed to the SBR tank by means of a submersible pump for reduction of BOD.
- iii. The reactor operating sequence will comprise Filling, Aeration, Settling, and Sludge Removal & Decanting with a pre determined time spans. Decanting pump will withdraw treated water from top and the sludge will be withdrawn with a submersible pump from bottom of the reactor after settling phase. Sludge will be collected to sludge storage tank combined with drying beds for dewatering.
- iv. Treated water from decanter pump of SBR tank will be fed through a perforated feed piping system to Gravity Sand filter consist with 4 different layers of filtering media to entrap the remaining particles.
- v. Treated water from the gravity sand filter will be then collected in to an Intermediate collection tank while feeding liquid chlorine to disinfect the treated effluent.
- vi. Then the disinfected treated water will be fed by means of dry mounted centrifugal feed pump to /activated Carbon Filter(ACF) followed by a Cartridge filter Array(CFA). Filter array consists of 3 parallel lines of which each consisting with 20 micron, 10 micron, 5 micron cartridges respectively to ensure effective entrapping very fine remaining particles; finally will give clear treated effluent

To facilitate high quality treated water from secondary treatment step with SBR, a pre aeration step has been installed in the equalization tank prior to commence SBR operation.

Diagrams of Treatment Process

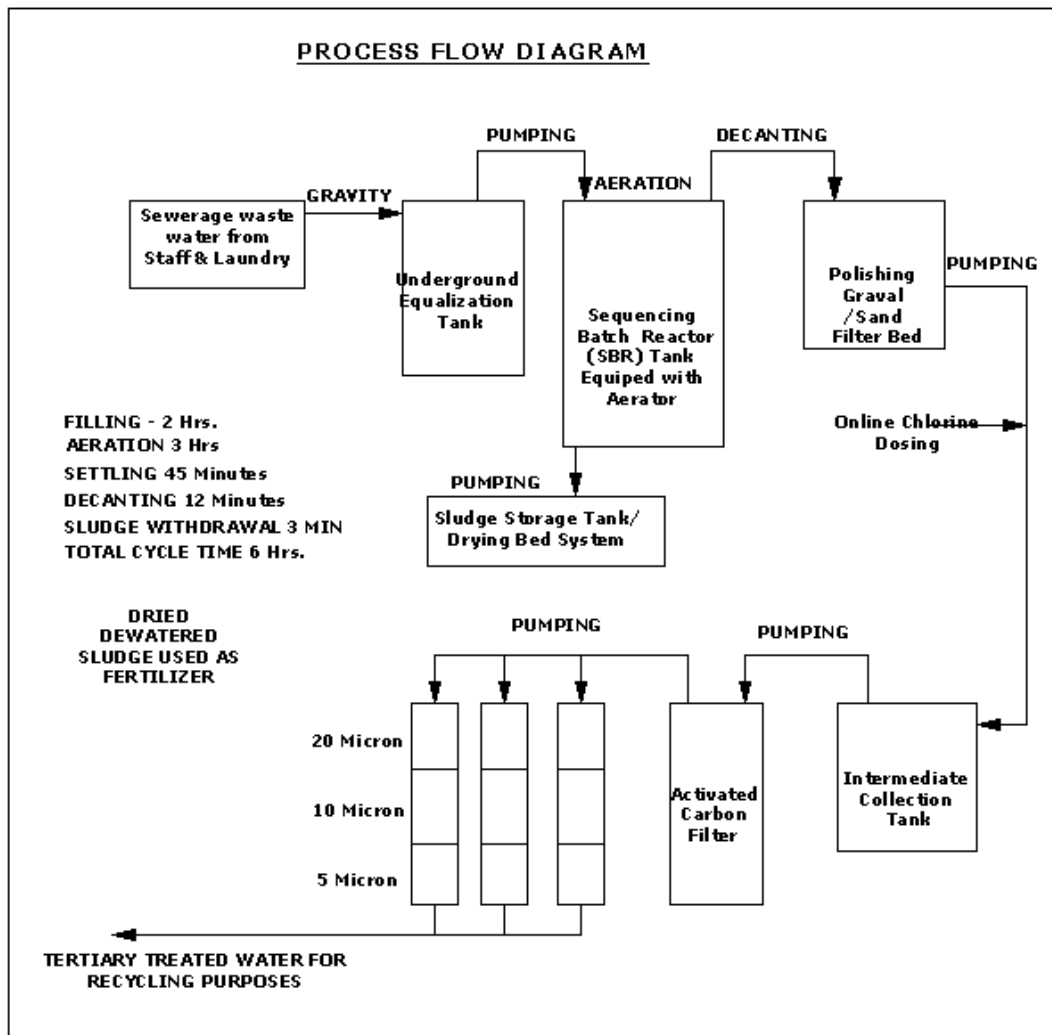


Figure 8: The flow-chart that indicates the process used at the waste water treatment plant

7. Solid waste management

Solid Waste at Ulagalla resort is segregated at the point of generation, all recyclable solid waste such as polythene, plastic, glass, paper and metal being collected separately and dispatched to recycling centers periodically.

Efforts are made to reduce the use of polythene, plastic water bottles and cans, etc. The staff of the resort is well briefed to create a polythene and plastic free environment.

Biodegradable waste is being composted and used as organic fertilizer for paddy cultivation, and also for organic vegetable and fruit gardens.

8. Organic Paddy , Vegetable and Fruit Garden

While selecting areas to erect chalets, areas that were without trees and a minimum amount of shrub were selected and special attention was given to ensure that no trees were cut down during the construction period. The resort includes over 20 acres of lush paddy fields, vegetable and fruit gardens. The paddy fields produce the entire resort's rice requirement while the vegetable and fruit gardens make substantial contributions as well. Figure 9 and 10 indicate the plots used for organic farming.



Figure 8: Plots with organic farming



Figure 9: Mixed cultivation with organic farming

9. Use of Electric Cars to avoid pollution

Another feature that is actively promoted at this resort is the use of electric cars to transport guest and also to provide other services.



Figure 10: Electric car service at the resort

10. Conclusion

Ulagalla Resort is a well planned project where many innovative features have been included that would give economic benefits either short or long term. This project that has been successfully completed and made operational in June of 2010 can be an important example that indicates many opportunities that would be available for those who value sustainable built environments and development. Its operation in coming years would be a very good learning exercise on sustainability.

References:

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