The design of a self-sustainable flagpole

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For this thesis my client is active in the flagpole market. The general aim is to deliver quality products for a fair price. Their core business is assembling flagpoles internally and installing or delivering them for the end-user.

Background information

Companies spend more and more money on advertising and branding. The clients wants to play to this market by offering the possibility to light the flag. Already existing solutions are a ground spot and the PoleLED. From this trend the objective to the assignment arises: create a stand-alone flagpole which can provide enough light to illuminate a flag during dark hours.
Especially in the case of a standalone flagpole it will be a challenge to make a feasible and affordable design which uses sustainable technologies to generate enough energy to make the flagpole self-sustainable.

Therefore, the following main question is drafted:

" *Is it feasible to create a well-designed, self-sustaining flagpole with a unique selling point, using sustainable technologies like wind and solar energy. And can this flagpole present a flag in the best way possible in during the day and dark hours?*

If it turns out to be feasible, how can the client best implement this technology in their current product portfolio? **"**

To answer this question this thesis describes a process consisting of the following parts:

Research

To find the answer to the question: "which sustainable technologies are available?", some research needed to be done. The main goal of the research is to find which energy generation technology can be applied to create a stand-alone functioning flagpole design. To be applicable the tech has to be sizeable and fit to the power usage of the lighting used in the design. Concluding, solar energy is best fitting to energy usage and size of a flagpole. Wind energy is the second technology that can be used. It can complement solar energy during less sunny times, however, wind energy has the disadvantage of requiring a large surface area.

New design

From the clients current product portfolio to a new design. The design process started by identifying stakeholders and competitors. How the current product works and how it's assembled. This is the background used in the brainstorming process. The brainstorm explored possible lighting solutions and how to implement solar and wind energy into the new design. 6 Concepts are formed from this brainstorm. The evaluation of these concepts resulted in the futuristic and unit concepts being the most promising. To be able to choose between the two concepts, testing was done to find out what is the best lighting configuration and calculations to the viability of the concepts are made. Concept futuristic offers the best solution for lighting. A more even coverage of the banner can be realised using a "rail" of LEDs. On the contrary concept Unit scores higher in viability. Depending on the location concept Unit can function stand-alone during 327 to 365 days a year, with a PV surface of 0.5m^2 implemented in the design.

Product implementation

To implement the new design in the product portfolios of the client two developments can be used. The first development is described in the background and reason for the assignment. More demand for advertising banners creates a bigger market for the clients to sell to. Companies are willing to spend more on advertising products including flagpoles, this result in the demand for a unique selling point of lighting. The other development is found in the company itself. They are working on a new mechanism to improve hoistability of the banner and decrease damage on the pole. This solution can be used to install the new design around.

Results & Recommendation

The result of the thesis is a prototype which describes the possibility to implement a new product in the clients portfolio and which supports the answer to the question: "is it possible to create a self-sustaining flagpole using renewable resources"

The calculations for viability show that using only solar energy will not be fully sufficient. The power shortage can be complemented by using wind energy. Or by designing a technical solution that ensures that light only turns on during a specific period of time or when someone is passing by the flagpole.

To create a final product that can be produced and marketed a combination of concept unit and futuristic can be used. Around the tubes described in "implementing in portfolio" a new armature can be designed. Using concept unit as basis, a slick shape can be designed. The armature can either include a light like the one used in the prototype equipped with a wide angle lens. Or it can include an array of multiple less bright LEDs in a shape like the bottom row of pictures in figure 24.

To also stay true to the requirements it would be best to use a design were all components, the PV panels, the lamps and battery, fit in one hoistable design.

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