Designing an enclosure for coating automation

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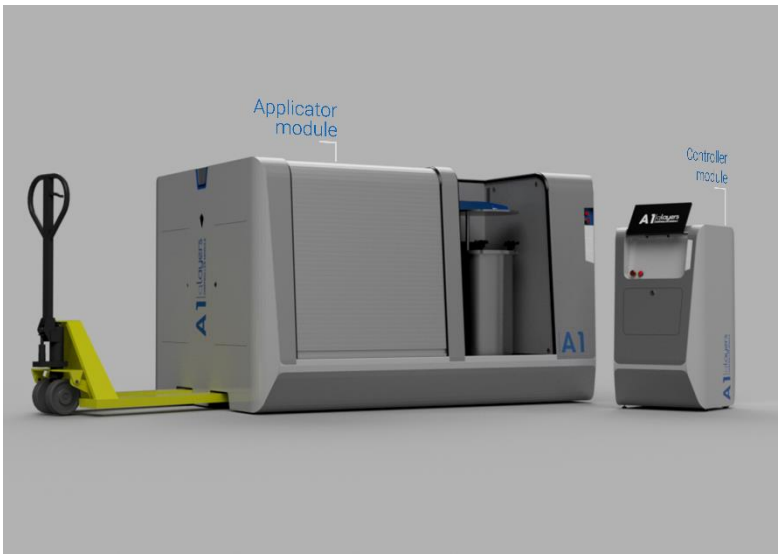
Topic and background information:



This assignment was executed for Qlayers. Qlayers is a start-up that is developing technology to automatically apply coatings on large industrial surfaces. Currently they are working on a device to coat large pipes: the Slash. At a later stage, the coating of other structures as ships and planes will also be automated. Besides this, they research the ability to apply sharkskin microstructures on surfaces to reduce drag/friction. This is useful in the airplane and wind turbine industry.

My assignment at Qlayers was to develop a new enclosure to house the components as well as the user interface(UI). The current enclosure is built as a functional prototype and designed to test the system. Design aspects like user interaction, designing for maintenance and production are not yet taken into account. Besides this the enclosure is not able to reflect the company values with the current aesthetic design.

Approach:

First the current enclosure design was analyzed in order to get a good understanding of the system, this resulted in an discussion and recommendation. This discussion and recommendation highlights the negative and positive points about the current design and layout. After this the environment and interactions were analyzed to get a clear picture about the use and possible use locations.
Research on possible manufacturing techniques was done at an early phase. This way it became clear what possible production techniques are suitable for the application. During an in-depth research of the production techniques the restrictions and parameters were collected.
This concluded the analysis phase, the gathered information was translated into the requirements for the new enclosure design. The next step was to reconfigure the layout for system optimization and easy Atex certification.

After creating the new layout a style was generated. This was done by first setting the goal for the aesthetics. When this was completed three concepts were generated with the focus on use and interaction. These concepts were elaborated and evaluated to pick the best fitting concept. With the selected concept and the generated style an aesthetic design was created. This design was realized into a CAD model. This CAD model was created for production and is ready to create a first prototype of the enclosure. For this CAD model an cost estimation is made to put a price on the designed enclosure.
With this newly designed enclosure Qlayers can make the step to the market.

Discussion and recommendation:

The newly created design needs to be tested at certain points. One of these point is the strength of the frame. The frame must withstand de load of a full paint barrel and the components. The stresses and deviations need to be determined and assessed. If the stresses or deviations are deemed to great the frame should be adopted to support the load. This can be done by adding material or by redesigning certain parts of the frame. It can also be that too much material is used for the load and less material can be used

The enclosure is designed to be suitable for all use-cases. For the use-case of coating large structures the slash should be able to move along with the motion system. This motion system can be a crawler driving along the large surface. In order make the enclosure movable an undercarriage can be developed. This undercarriage can be driven by a simple mover. When the system is ready to coat the storage tanks this undercarriage needs to be developed.

Some parts regarding the design of the integrated lid-lift for lifting the heavy lid of the pressure vessel need to be revised. Clearances of the parts from the guide system are currently too small. The change of jamming is therefore present.

If the enclosure will be build the points as mentioned above need to be modified in order to create the final enclosure.