EXOSKELETON

One of Gesnaer's goals has been to keep developinig technology through our R&D department in our Madrid offices. One of the projects we have been thoroughly working on is our exoskeleton. In an industry where lifting heavy objects is done at all times, guaranteeing the operator's safety is key.

The exoskeleton will not only provide your company with added safety but it will also create for a better working experience and environment for the operator which translates in faster operating times and smaller turnaround times.

The exoskeleton is held and powered by the Unit of Action which is connected to the main structure that holds the exoskeleton in place. The Unit of Action houses the main engine that powers the movement of the exoskeleton that will aid the operator when lifting heavy objects. The Unit of Action is made out of aluminium so that it can:

- Support the weight of the whole structure
- Stand the possible high temperatures due to overheating of the mechanical and/or electrical components
- Create an electromagnetic barrier between each component

The system works when the engine rolls and unrolls a cable wrapped around a steel cilinder, that helps the operator and takes off the weight that has to be lifted. This cable is called a Bowden cable and its made of a protective case made out of a rubber-like material that covers a flexible metal tube, an interior teflon cable that houses the twisted steel cable that rolls and unrolls at the engine to aid the operators.

The speed at which the cable can roll and unroll must not be greater that 0.5m/s and its torque, not greater than 18Nm. All this was calculated based on the anatomy of the human body and the type of environment this exoskeleton will be used in.

The cable is then attatched to the part of the exoskeleton that will be attatched to the operator's forearms. Once the operator grabs a piece of luggage, the system will register it with the pressure/strenght sensors that will be fitted as part of the exoskeleton. This change in pressure will make the engine roll or unroll cable, depending on the needs of the operator and how the movement will be made.

There are a lot of engines to choose from in the market, but we have chosen to go with a Brushless Engine which, for us and our project, presents certain advantgages over an engine fitted with brushes on it, such as:

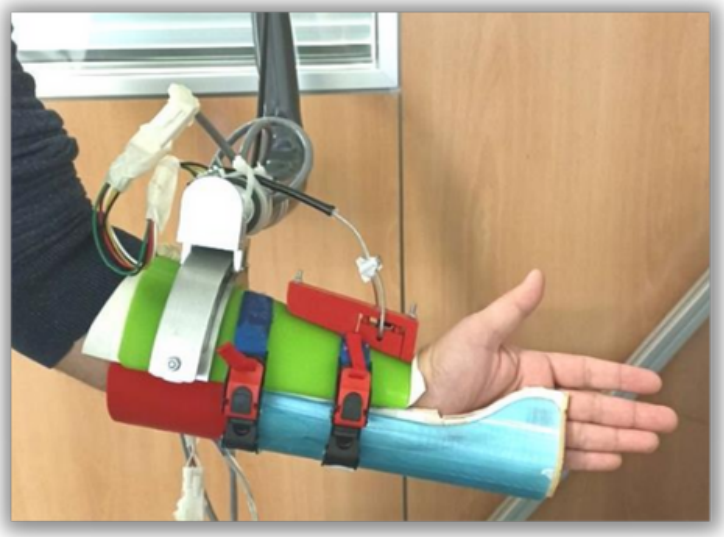
- Increased efficiency
- Wide range of speeds and adaptability
- Greater starting torque
- They are able to work with smaller tension values (48/24/12 V)
- Capability to work in a wide range of temperatures to adapt to any environment (-10ºC/50ºC)

There is another important component that shapes the way the whole system works. These are the strenght sensors, which are small sensors placed between the operators forearm and the exoskeleton structure in pressure points so that the strenght being applied can be calculated and the engine can proceed to roll or unroll cable depending on the strenght needed at that time.

Due to the different factors involved in the working environments that the exoskeleton will be used in, we have decided to install Resistive Strenght Sensors which are made of a polymer film and that lead to a decrease in resistance when the strenght applied on the active area increases.

These sensors have the followin specs:

- Working tempreatures between -30ºC and 60ºC
- Less that 1mm thick so it can be placed anywhere
- Low cost (between $6 and $20 each)
- Wide strenght sensitivity range (1N-450N)



The whole structure described is connected to 2 rails that are above the operators which allows the whole system to move freely wherever the operator needs to go. The rails also have other functions:

- Allow a 360º rotation of the whole structure
- Increase the distance that the operator can move to be able to pick bags up
- Allow the system to rest within the loading/unloading area without interfering with other systems.

One of the sketches we have created for the railing system that hosts the structure is made of a round and squared board that rest on the rails and holds the weight of the structure. The operator would only have to put the exoskeleton on and move freely through the railing system to reach wherever the bags that need to be loaded/unloaded are

CONTACT US

+34 916 527 764
Calle Playa Riazor, 22, Madrid
gesnaer@gesnaer.es
www.gesnaer.es