



# Geared Wheelchair Solution



## Our Client

An NGO with an aim to empower the differently abled, operating in one of the Latin American countries.

## Why they needed us

They wanted a solution that would enable the differently abled to self-drive the wheel chair. They didn't prefer a motorized solution, because reliable source of electricity was questionable in their region and they wanted the users to be able to manoeuvre inclined surfaces with minimal effort and risk.

## What we did

Since they had limited funding, we decided to design a wheel that could be retro-fitted with the existing wheel chairs. We wanted to achieve a similar comfort level in terms of use, as that of a motorised solution without actually using motors. This meant that the system needed to have the following requirements.

- Easy switching between climbing up, climbing down and normal mode.
- No roll-back while climbing up.
- Differential motion capable to achieve a sharp turn radius.
- Light weight.
- Controlled descent with auto breaks.

We designed a system with a hypocycloidal gear train consisting of a ring gear, a spur gear and a hold gear to achieve the above mentioned requirements. Care was also taken to make sure that the gear train offers minimum resistance while operating in the normal mode.

We designed the system using SolidWorks and iterated over material choices for the wheel frame and different composites choices for the gears, in order to achieve the required factor of safety while maintaining minimum cost (material + manufacturing + assembly), based on simulation results obtained from Ansys.

We conducted contact stress analysis simulations for different scenarios for the gears and decided to use Al-SiC composite and we conducted static structural analysis and modal analysis to study the dynamic behaviour of the wheel under different situations and decided to use Carbon Fiber Reinforced Plastic (CFRP) for the wheel frame.

We generated a Configurable Bill of Materials for Engineering, Manufacturing and Assembly and 2D Engineering Drawings to help them to locally manufacture and assemble the wheel.

We created the user manual and service manual for the wheel.

## How they benefited

They were able to improve the quality of life for a significant number of people in their region with minimum cost.

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### About Redeem Systems

*Redeem Systems is a pure-play Engineering and Digital Services Company with focus on mission critical highly engineered + high availability systems. Our global presence spans Asia-Pacific, Middle-east, Europe and North-America.*

*Our focus verticals include – Tele-communications, Medical Electronics and Aerospace & Strategic Electronics.*

*Our Product Engineering competencies include Product Design and Development, Verification & Validation, Emerging Markets Strategy and Product Life-Cycle Extension through Value Analysis and Value Engineering*

*Our Digital competencies are focused on Industrial Internet-of-Things (IIoT), Engineering Big Data Analytics and Software Defined Networking (SDN)/ Network Functions Virtualization (NFV).*