

# Composite pressure vessels manufacturing through Filament Winding process.



FORZA COMPOSITES



**Sergio Nascimento**  
Co-founder

**VIII**

**CONGRESSO INTERNACIONAL**

16 de Agosto de 2022



WHO WE  
ARE



FORZA COMPOSITES

Forza Composites is a Brazilian Startup focused on the development of composite based products and technologies.



São José dos Campos, SP

WHAT  
WE DO



FORZA COMPOSITES



R&D&I






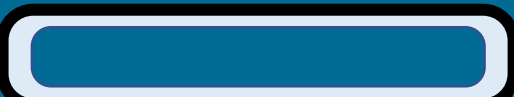

Manufacturing



Consulting

# PRESSURE VESSELS

## short intro

-  **TYPE I** // all metal (steel/aluminum)
-  **TYPE II** // metal liner with composite hoop wrap
-  **TYPE III** // metal liner with composite full wrap
-  **TYPE IV** // plastic liner with composite full wrap
-  **TYPE V** // all composite

# PRESSURE VESSELS

## market review

### Lifetime marketshare



**90%**

Type I Pressure Vessels

**10%**

Type II, III and IV Pressure Vessels

### Forecasted marketshare



**55%**

Type I Pressure Vessels

**45%**

Type II, III and IV Pressure Vessels



NPROXX

# PRESSURE VESSELS

market  
review

## AEROSPACE

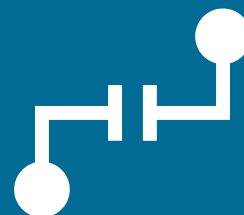
Oxygen and gas storage on aerospace vehicles



## BULK

### TRANSPORTATION

Supplying of refueling stations



## FUEL TANK

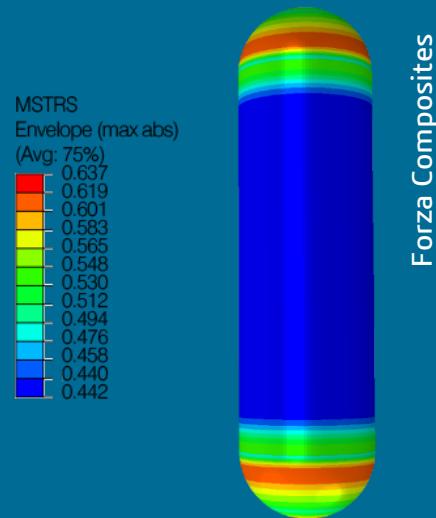
Passenger cars, buses and other vehicles



# PRESSURE VESSELS

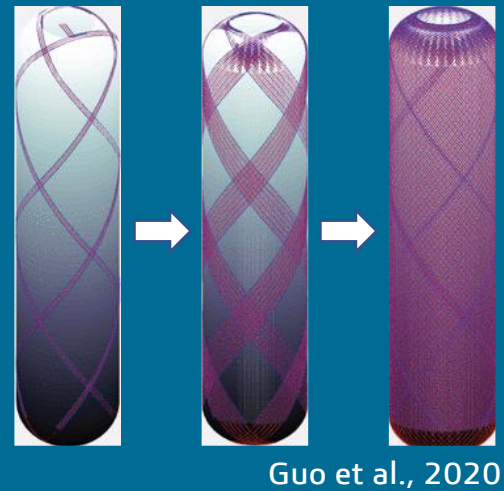
getting technical

## Analysis



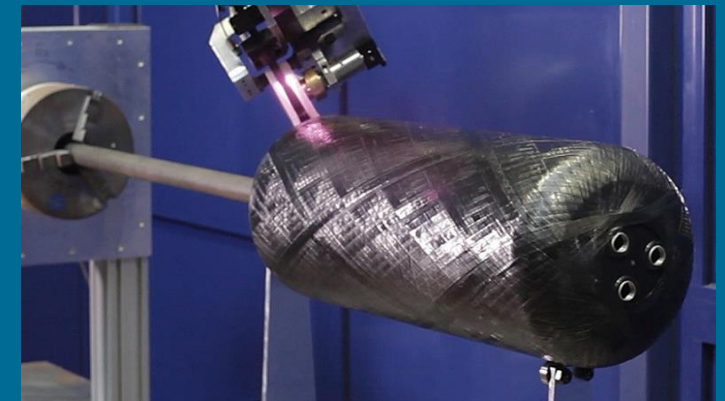
Structural Analysis  
Finite Element Model

## Design



Geometry definition  
and winding pattern  
design

## Manufacturing



fraunhofer.de

Filament winding

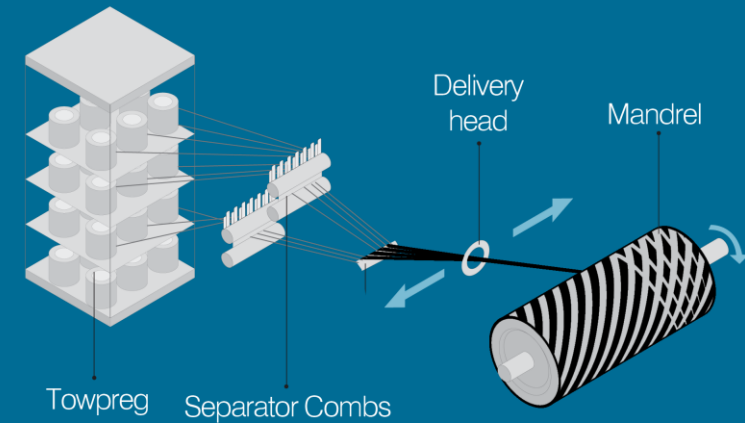
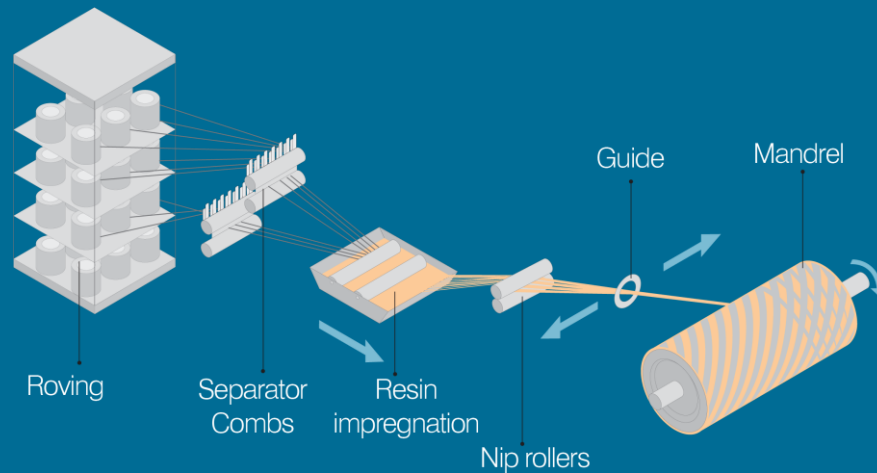
# PRESSURE VESSELS

getting technical

## FILAMENT WINDING

### WET WINDING

### TOWPREG WINDING



poliya.com



# PRESSURE VESSELS

getting  
technical

- Burst Pressure testing
- Impact testing
- Fire testing
- Abrasive testing

## TESTING

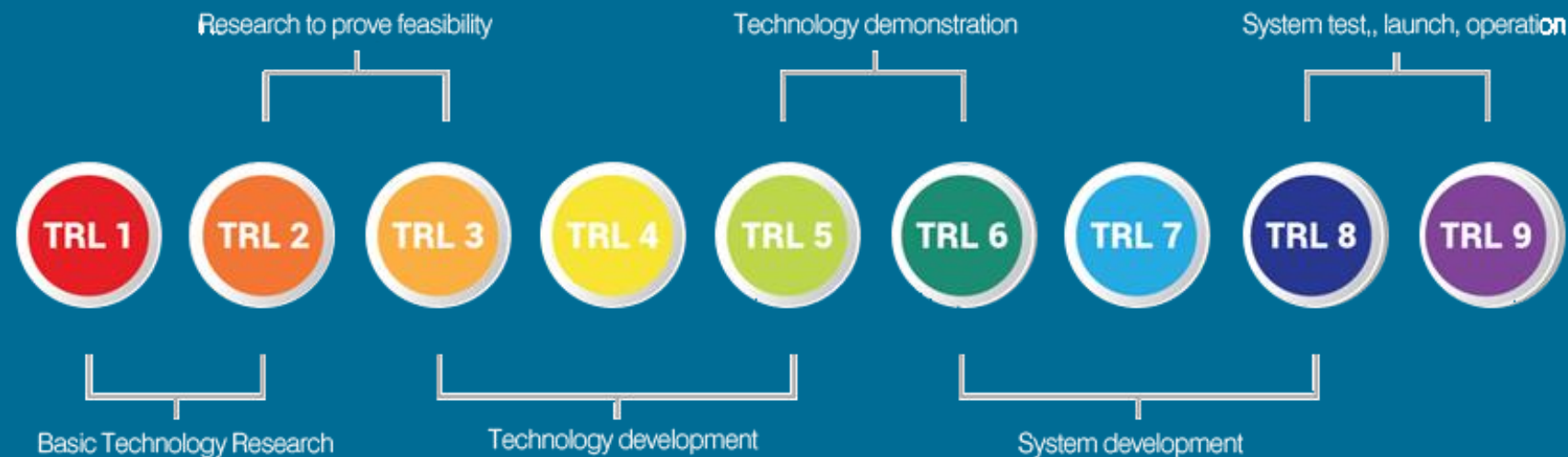


Ability Composites

# PRESSURE VESSELS

## Technology development

### TRL scale



# PRESSURE VESSELS

## Achievements



## What we have achieved so far?

- PIPE Fapesp financial support
- Finite element analysis
- Design of Winding patterns
- Manufacturing trials
- Market Development
- First investing round



**Thanks for your attention!**



FORZA COMPOSITES

**the future is composite**

**nascimento@forzacomposites.com**