



# Sparking your business.

Pemamek Oy Ltd

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**pema**  
WELDING AUTOMATION

# Unique Solutions for Serial Production of Wind Energy Plant Steel Structures

Rüzgar Enerjisi ve Santralleri Semineri  
International Wind Energy and Power Plants Seminar

Rahmi Koç Museum Conference Hall  
27<sup>th</sup> of May 2011 – Istanbul

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M.Sc. (Eng), Sales Manager  
Pemamek Oy, Finland

# Topics of this presentation

- Pemamek Oy Ltd today, facts and introduction to business
- PEMA Business lines, examples of supplies
- PEMA Unique Solutions for Serial Production of Wind Energy Plant Construction

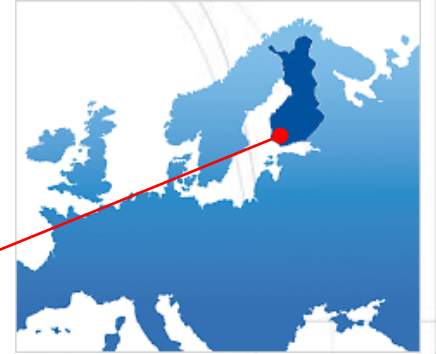
# Pemamek Oy Ltd

- Pemamek Oy Ltd is a world leading supplier of industrial solutions for heavy welding automation.
- Pemamek's engineered solutions and Standard Hard Automation systems are branded PEMA.
- PEMA is applying the latest robot and automation technology, designing and manufacturing heavy-duty welding automation systems and work piece handling equipment.
- Complete automation solutions are Pemamek's core competence, carried out in co-operation with customers according to their special needs.

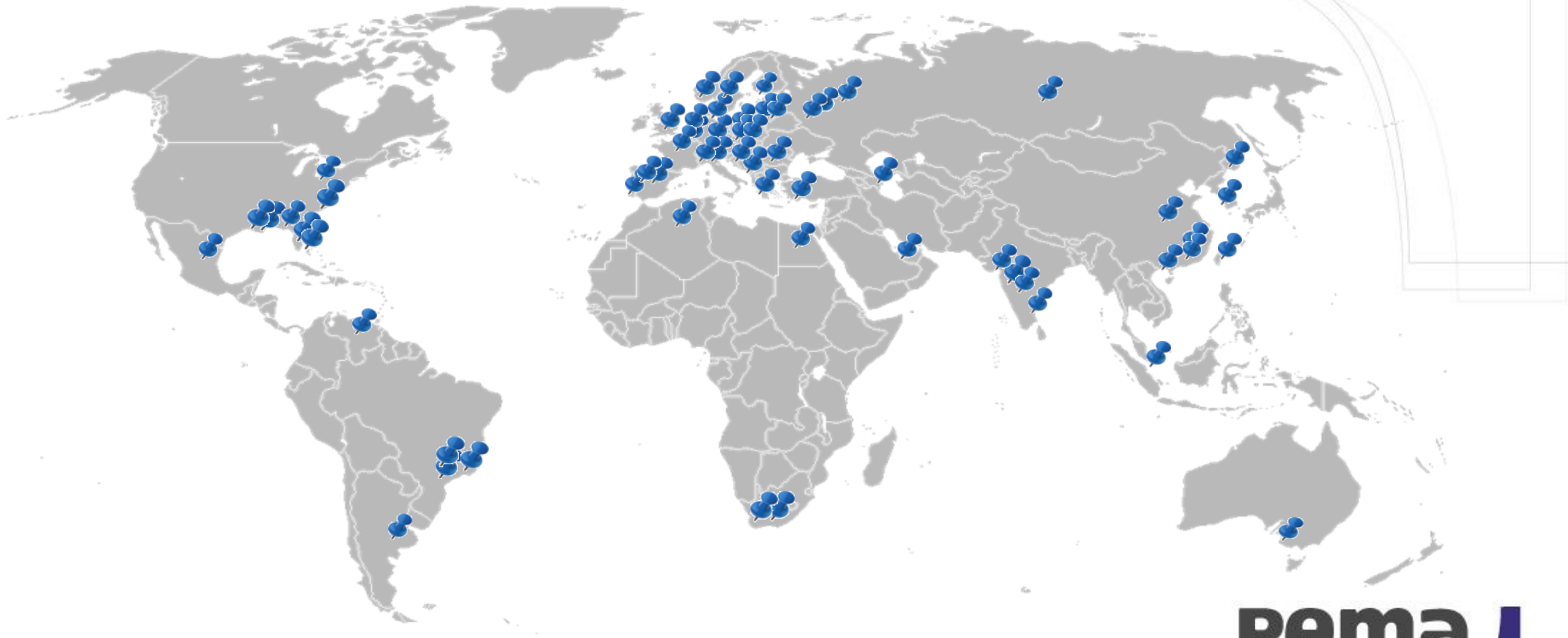
# Pemamek facts

- Established 1970, located in Loimaa, Finland
- Personnel 135, including engineering capacity of 50 people
- Net sales EUR 35 million (2010)
- Exports world-wide over 90% of its production, more than 50% outside of Europe
- Co-operation with leading global partners

# Modern automation facilities in Finland



# Pema deliveries around the globe



# PEMA Business lines



Heavy engineering



Mobile machinery



Civil construction



Shipbuilding and offshore



Industrial boilers



Wind energy



Process and nuclear



Customer support



# PEMA Business lines



Heavy engineering



Mobile machinery



Civil construction



Shipbuilding and offshore



Industrial boilers



Wind energy



Process and nuclear



Customer support

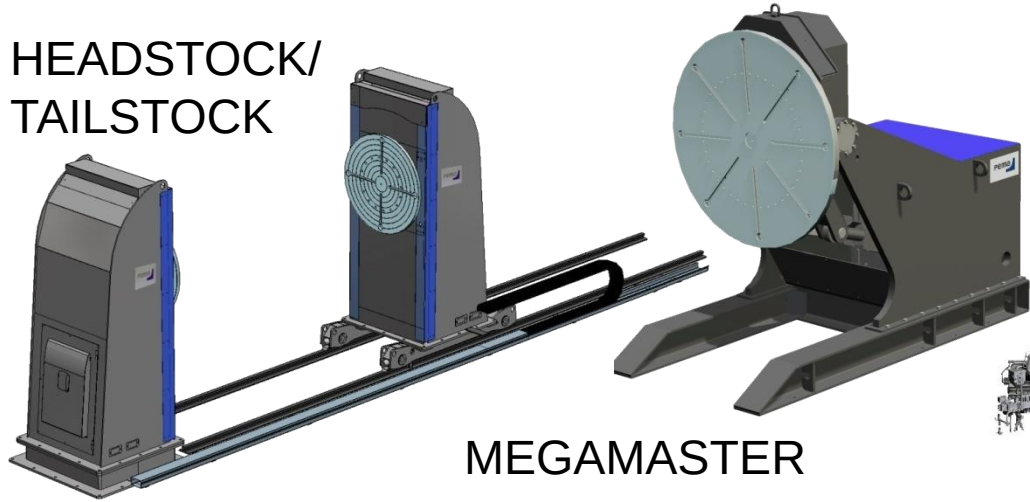
# Taking productivity to new heights

SKYHOOK

SKYMASTER

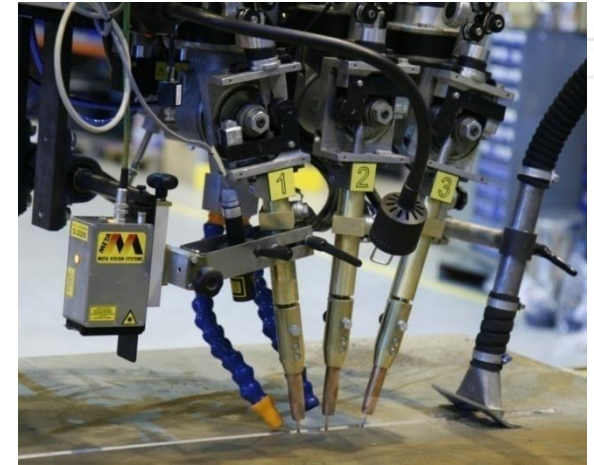


HEADSTOCK/  
TAILSTOCK



MEGAMASTER

- The effective handling of heavy steel structures is as important to productivity as the welding function itself.



# PEMA Business lines



Heavy engineering



Mobile machinery



Civil construction



Shipbuilding and offshore



Industrial boilers



Wind energy

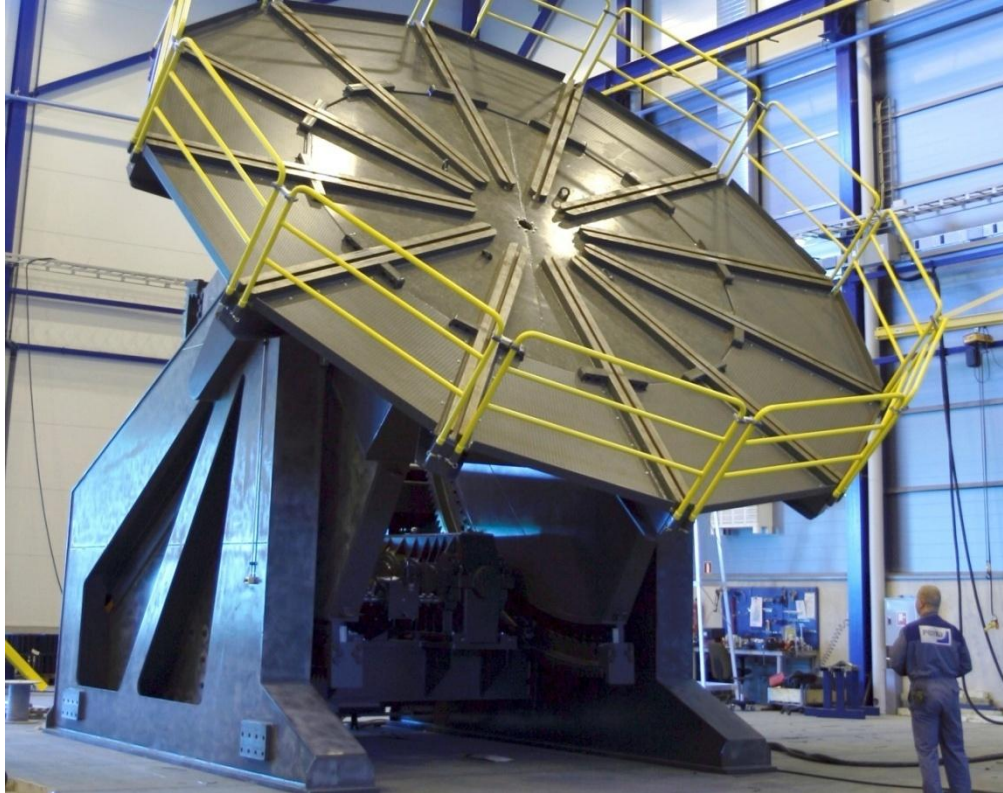


Process and nuclear



Customer support

# Count on reliability and safety



- PEMA is specialized on manipulating heavy objects.
- Positioners up to 250 tons loading capacity
- Roller beds up to 1600 tons loading capacity
- Heavy-duty column & booms and tailored welding platforms

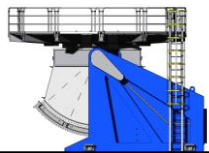
# PEMA positioner vs. Airbus A380

The world's largest jetliner

## Airbus A380

Total length ..... 73 m

Typical operating empty weight ..... 252 200 kg



Heavy-duty positioner

## PEMA 250000 FA

Total length ..... 9 m

Loading capacity ..... 250 000 kg

# Count on reliability and safety



- The PEMA work-piece handling range for steel production safely and efficiently handles extremely heavy steel structures and unconventional alloys

# PEMA Business lines



Heavy engineering



Mobile machinery



Civil construction



Shipbuilding and offshore



Industrial boilers



Wind energy



Process and nuclear



Customer support

# Greater profitability in product family-based production



Front  
chassis

# Greater profitability in product family-based production



TRACTOR TRAILERS

# Complete PEMA factory delivery

Lincoln Electric  
**POWER WAVE**  
processes

## PEMA delivery included:

- Röstler - plate blasting
- Arku - plate straightening
- LVD – plate bending

## PEMA AUTOMATION:

- Laser cutting for boom plate parts, 2 robots
- Boom welding with Tandem MAG process, 4 robots
- Robotised plasma cutting of boom ends and holes
- Robot welding stations for final welding, 6 robots
- Conveyors and material handling

# Greater profitability in product family-based production



# Greater profitability in product family-based production



# Greater profitability in product family-based production



# PEMA Business lines



Heavy engineering



Mobile machinery



Civil construction



Shipbuilding and offshore



Industrial boilers



Wind energy



Process and nuclear



Customer support

# Integrated manufacturing solutions for enhanced efficiency



- PEMA provides a high level of automation utilisation, production flexibility and a revolutionary increase in efficiency

# efficiency



- # efficiency



# PEMA Business lines



Heavy engineering



Mobile machinery



Civil construction



Shipbuilding and offshore



Industrial boilers



Wind energy

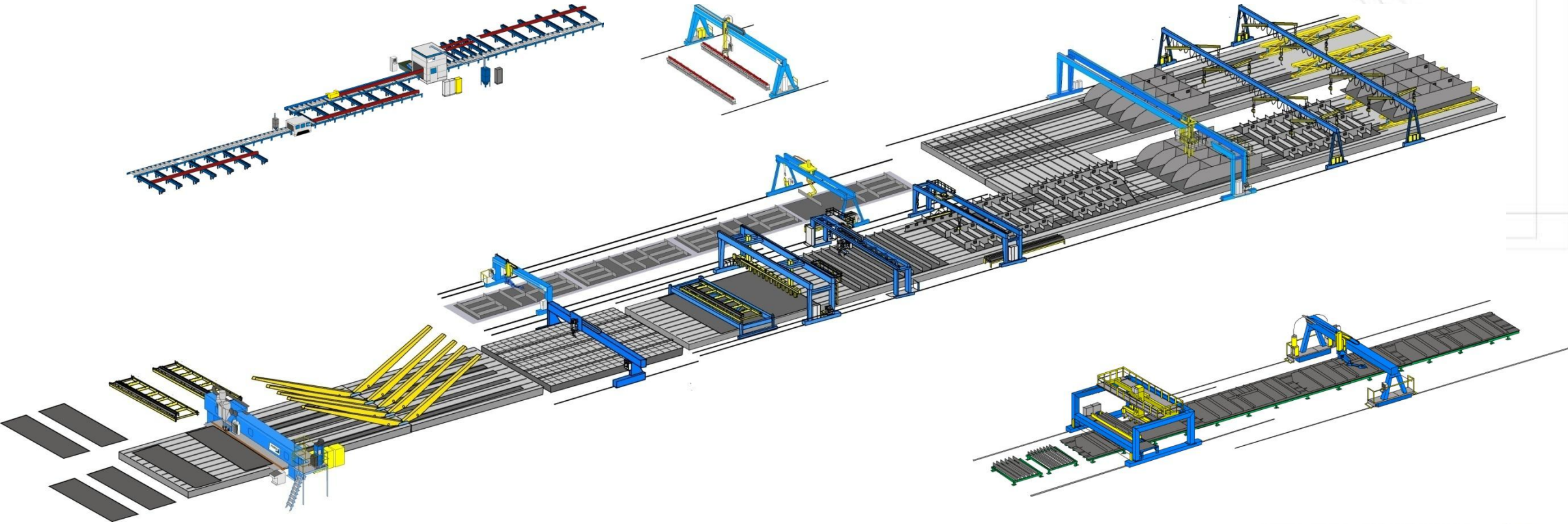


Process and nuclear



Customer support

# Revolution in steel production with shorter throughput times



# Revolution in steel production with shorter throughput times



# Revolution in steel production with shorter throughput times



# PEMA Business lines



Heavy engineering



Mobile machinery



Civil construction



Shipbuilding and offshore



Industrial boilers



Wind energy

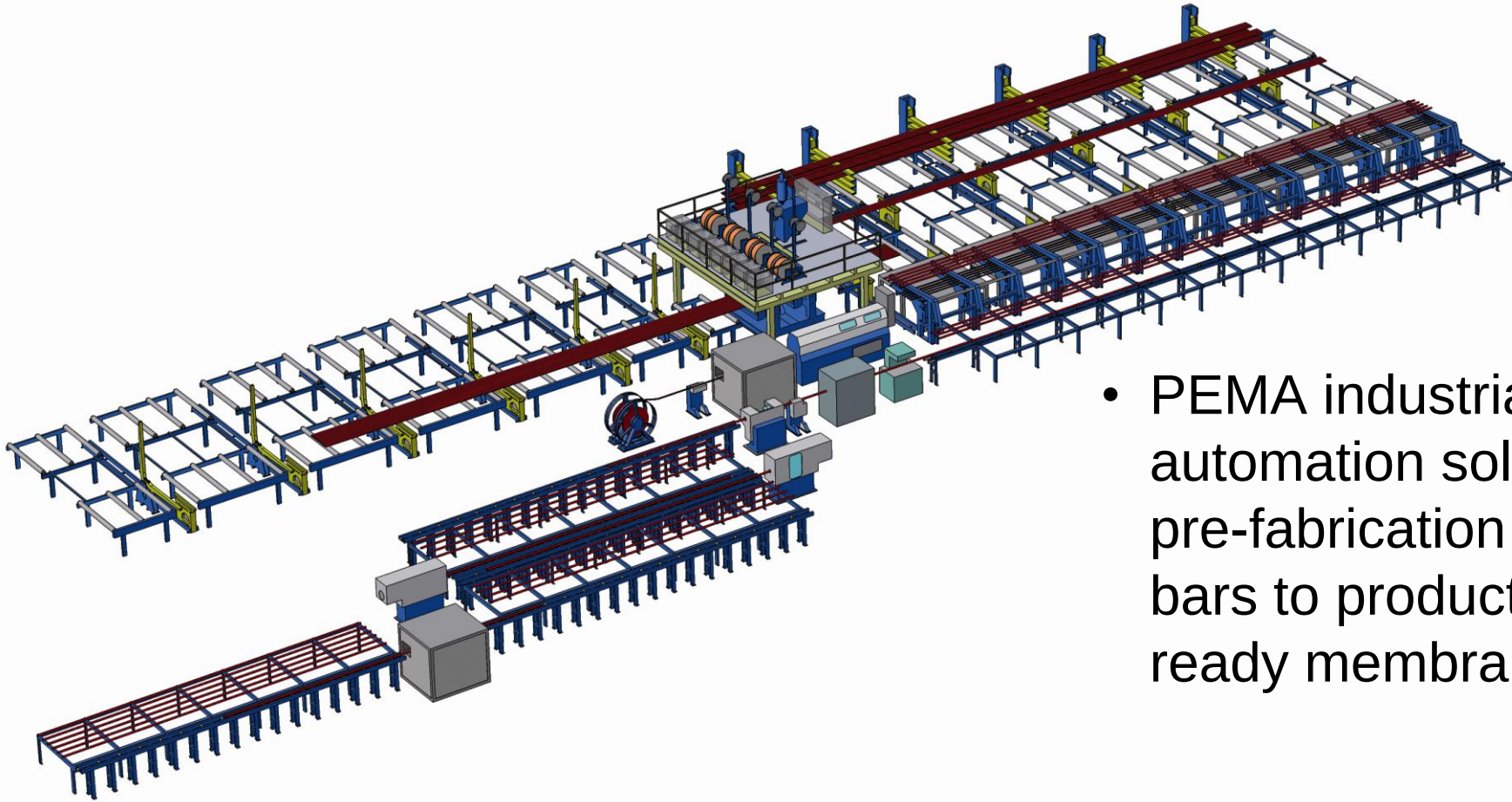


Process and nuclear



Customer support

# High quality in mass production



- PEMA industrial boiler welding automation solutions extend from pre-fabrication of tubes and fin-bars to production of installation-ready membrane wall panels

# High quality in mass production



- Material control integrated into production line architecture gives users the power to cost-effectively handle steel production material flows

# High quality in mass production



# PEMA Business lines



Heavy engineering



Mobile machinery



Civil construction



Shipbuilding and offshore



Industrial boilers



Wind energy



Process and nuclear



Customer support

A photograph of an offshore wind farm with several white wind turbines in a blue sea under a clear sky. The image is framed with rounded corners and has a blue graphic overlay on the right side. The text "Wind energy" is centered in the image.

# Wind energy

# Wind Energy in Turkey

- Today the installed wind energy in Turkey is about 1.400 MW
- Target for wind energy production until 2023 is 22.000 MW
  - This means with the average size of 3 MW/turbine around 7.300 new wind mill turbines and towers equal with around 600 pcs per year
- In addition to above mentioned the increasing potential in neighbouring countries request much more production capacity as available today in Turkey

# Efficient wind tower production

## Plate preparation

## “Can” manufacturing

## Section building

## Finalizing the sections



Material  
receiving

Plate  
cutting

Bevelling

Roll  
bending

Shell/flange  
welding

Section  
joining

Door frame

Blasting

Painting

Final  
fitting

# Efficient wind tower production

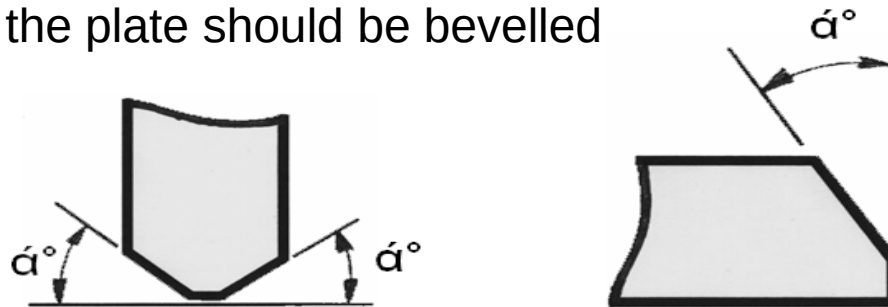
## Plate handling and treatment

The normal plate size for land based towers is up to 15x3 meters.

For conical tower sections the plates should be cut to shape.



All edges of the plate should be bevelled

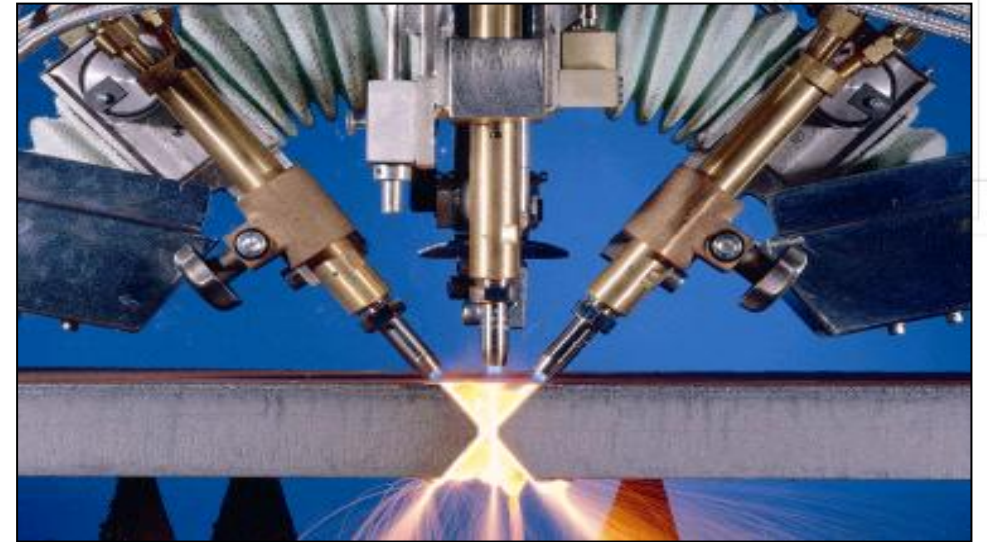


# Efficient wind tower production

## **Plate handling and treatment**

The thickness of plates for land based towers are normally between 12 and 50 mm.

The cutting and bevelling of plates in a correct way will be beneficial through the whole manufacturing process.



# Efficient wind tower production

## **Plate handling and treatment**

Some producers purchase the plates cut and bevelled to size.



# Efficient wind tower production

## Roll bending

The capacity of the roll bending machine is related to the combination of plate thickness, plate width and internal diameter. For a large range of thicknesses/width/diameters it might be required with 2 machines.

The result of the roll bending is essential to all fit up and welding operations!



# Efficient wind tower production



## Roll bending

After the actual bending the shell is tack welded both from inside and outside.

# Efficient wind tower production



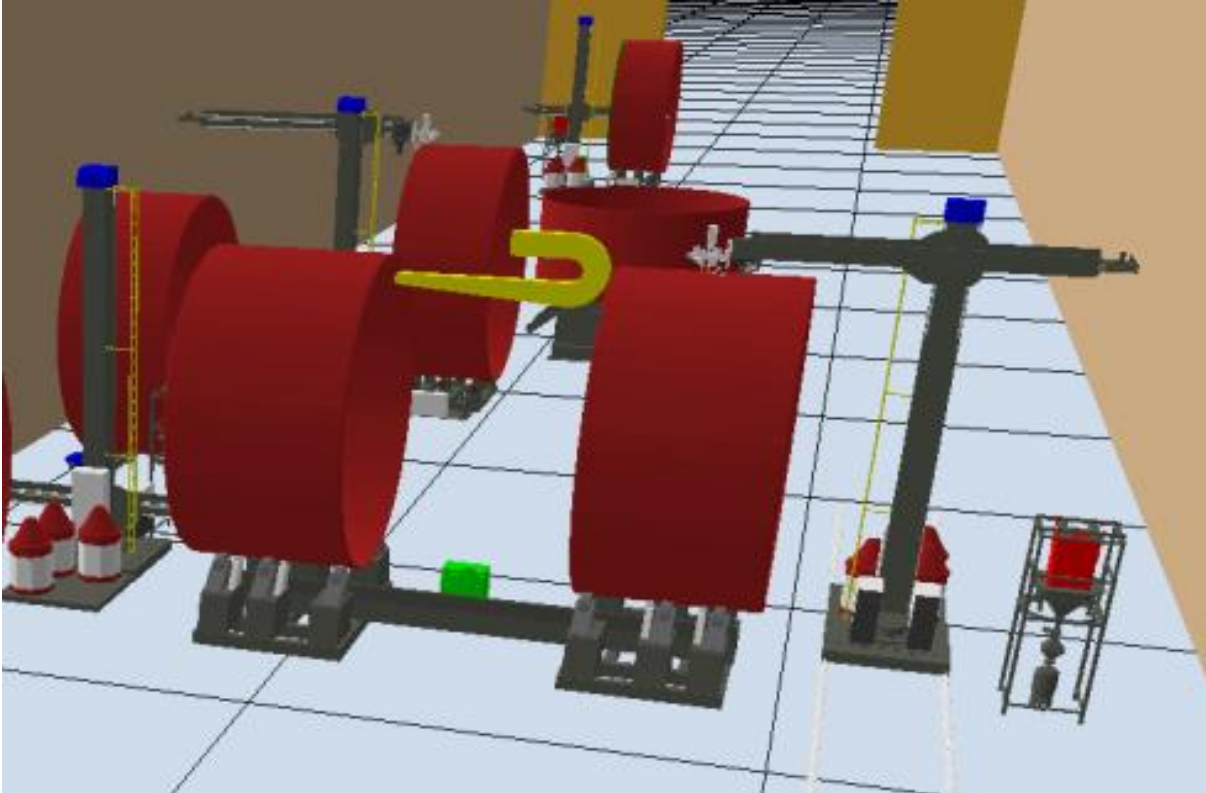
## **Traditional long seam welding of the shell/can**

The shells are welded with SAW from inside and outside. Start and stop plates are fitted at the end of the joint for best result.

Roller beds with fit-up system for conical sections

# Better profitability by systematic, high-volume serial production

- Unique PEMA long seam welding



# Better profitability by systematic, high-volume serial production

- Unique PEMA long seam welding



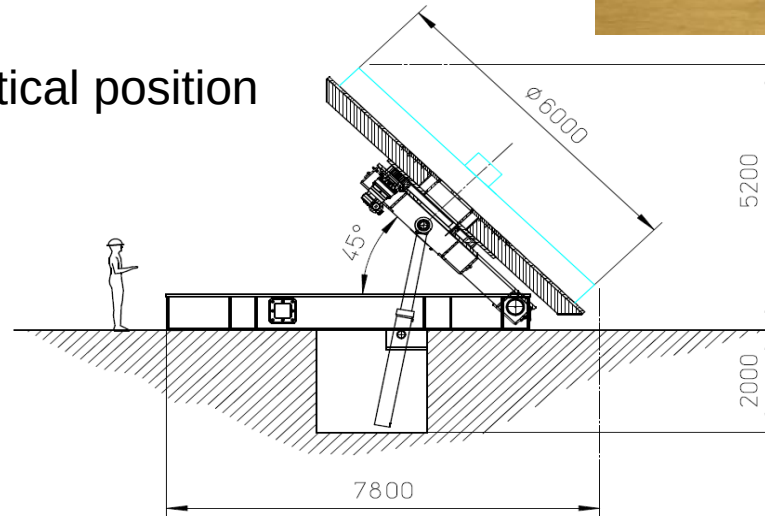
# Efficient wind tower production

## Fitting of flanges

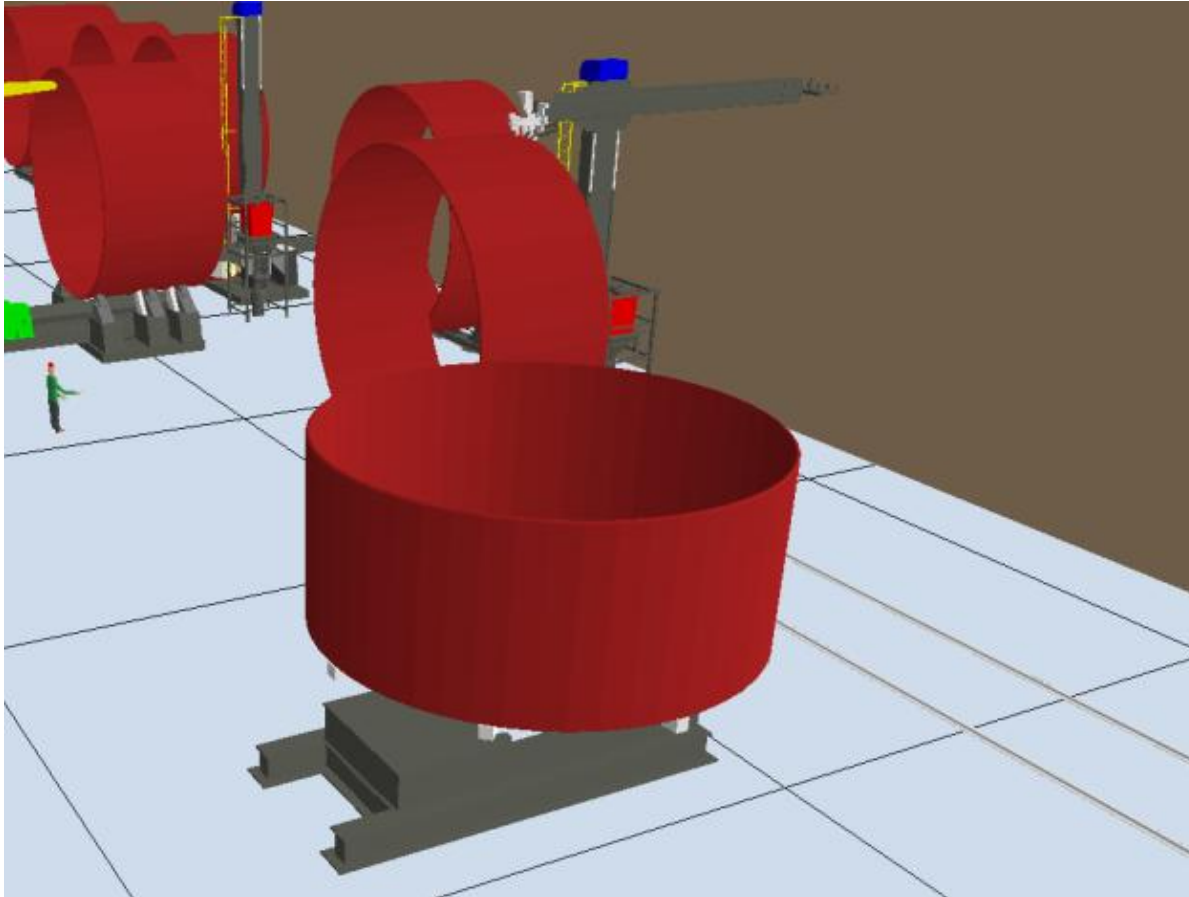
In average every 3<sup>rd</sup>/4<sup>th</sup> shell is fitted with a flange that will form the end pieces of the sections.

The process consists of several steps:

- Tilting of shell from vertical to horizontal position
- Placing flange on fitting table
- Placing shell on top of flange
- Fitting and adjusting
- Tack welding
- Tilting back the shell to vertical position



# Better profitability by systematic, high-volume serial production

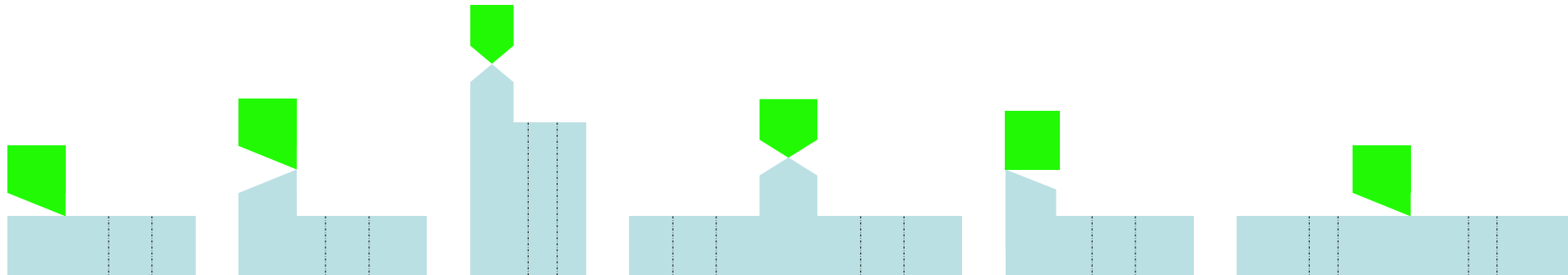


- Flange assembling and welding by using work piece positioners

# Efficient wind tower production

## Welding of flanges

Depending on the design of the flanges the joint types can be of various types. The key issues here are to have a stable support and an accurate rotation in the roller beds.



Example of flange types

# Efficient wind tower production

## Traditional welding of flanges



# Better profitability by systematic, high-volume serial production



- Unique PEMA integrated flange and long seam welding

# Efficient wind tower production

## Building sections

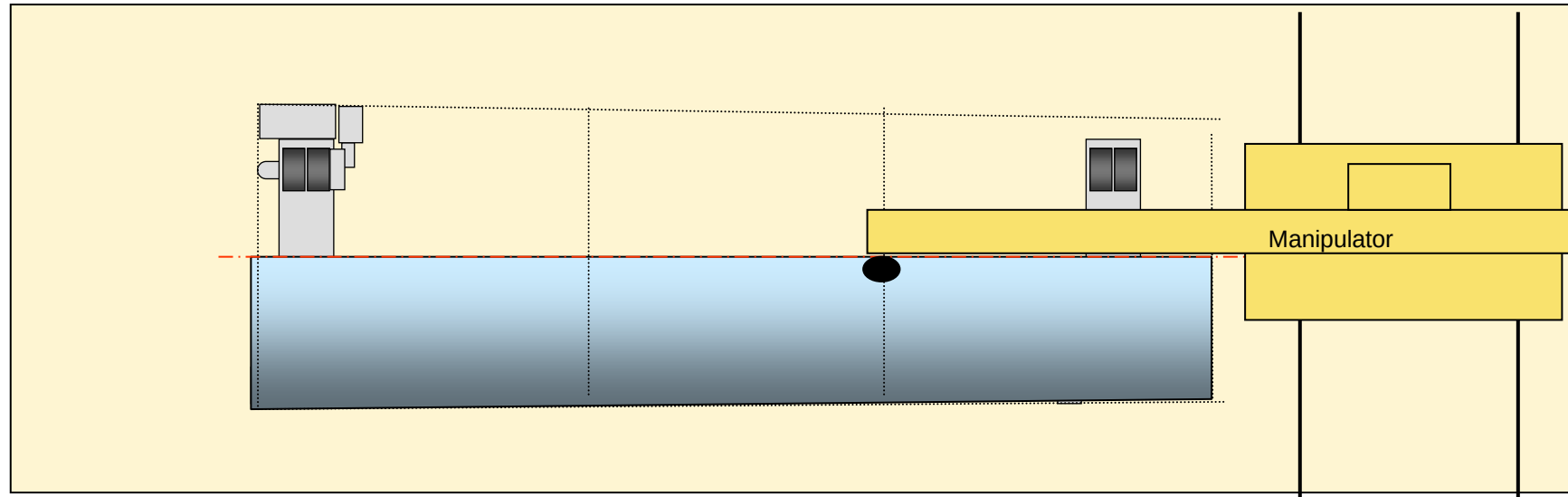
There are several methods of building sections depending on space, manpower, capacity required and initial investment.

- Traditional way with roller beds and a welding manipulator
- **Unique PEMA fit-up station and welding manipulator**
- Head&tailstock with rounding jigg and welding manipulator
- Double head&tailstock with rounding jiggs and welding tower

# Traditional wind tower production

## Building sections

- Traditional way with roller beds and a welding manipulator



# Traditional wind tower production



## Building sections

- Traditional way with roller beds and a welding manipulator

# Traditional wind tower production

## Building sections

- Traditional way with roller beds and a welding manipulator

### Advantages

- Flexible operation
- Lower investment cost

### Disadvantages

- Continuous crane operation needed
- Slow production rate
- Safety risks in crane operation
- Straightness problem

# Efficient wind tower production

## Building sections

- Unique **PEMA fit-up station** and welding manipulator (“growing line”)

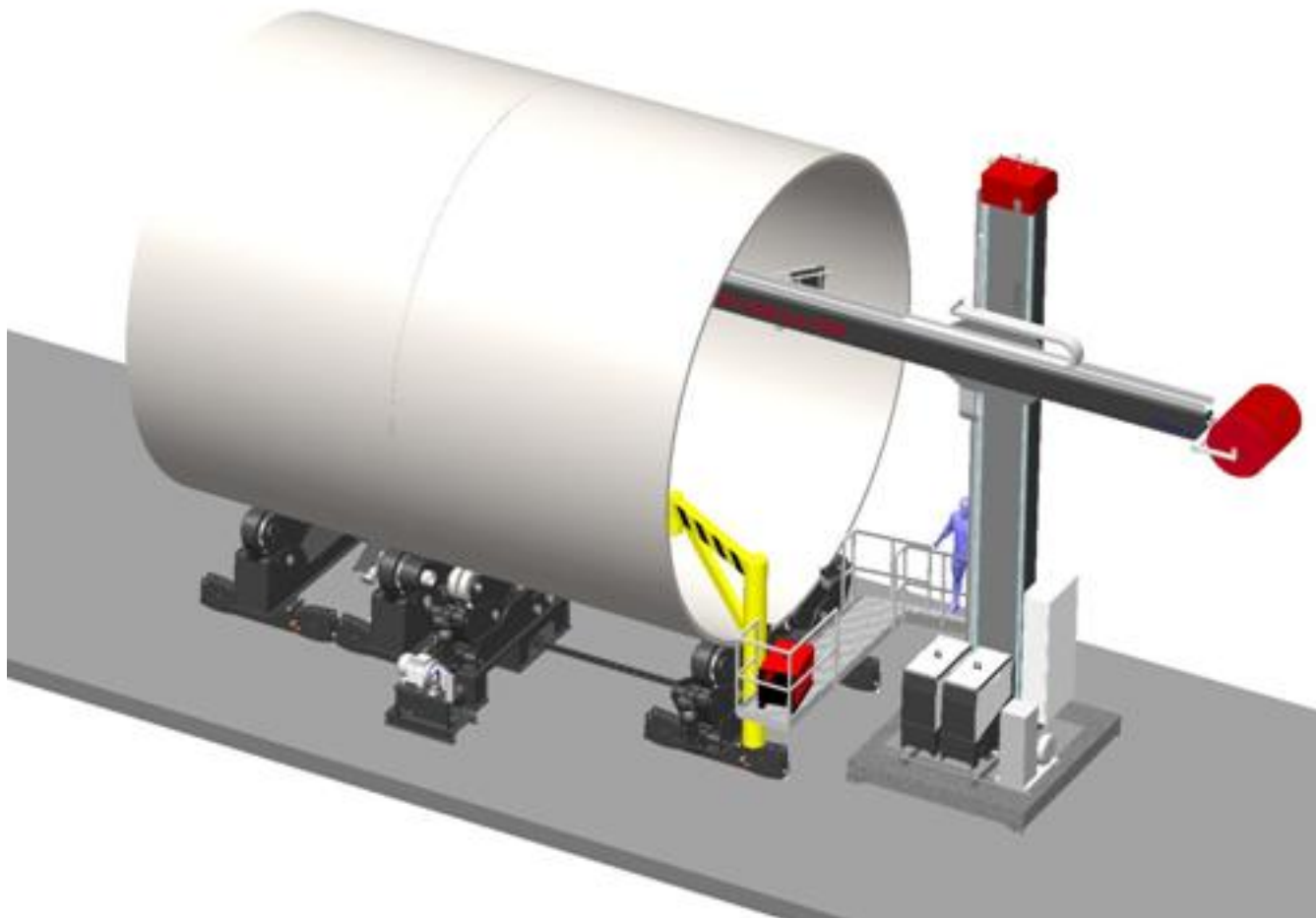
## Advantages

- Flexible operation
- Fast fit-up time
- Higher capacity compared to other alternatives
- Less space required
- Less straightness problems
- Less manpower required
- Higher welding speed

## Disadvantages

- Crane operation needed
- Safety risks in crane operation

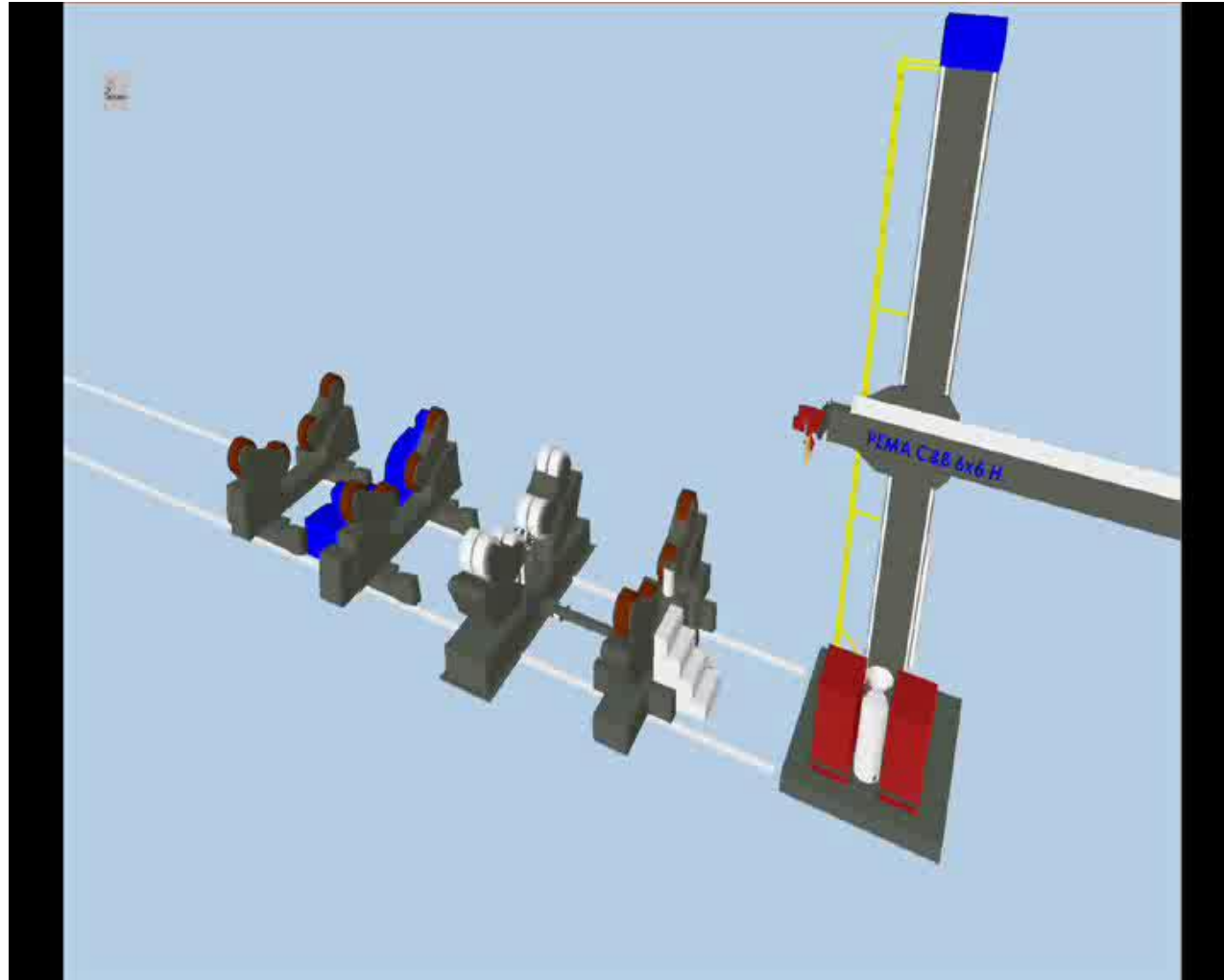
# Efficient wind tower production



## Building sections

- Unique **PEMA** fit-up station and **welding manipulator** (“growing line”)

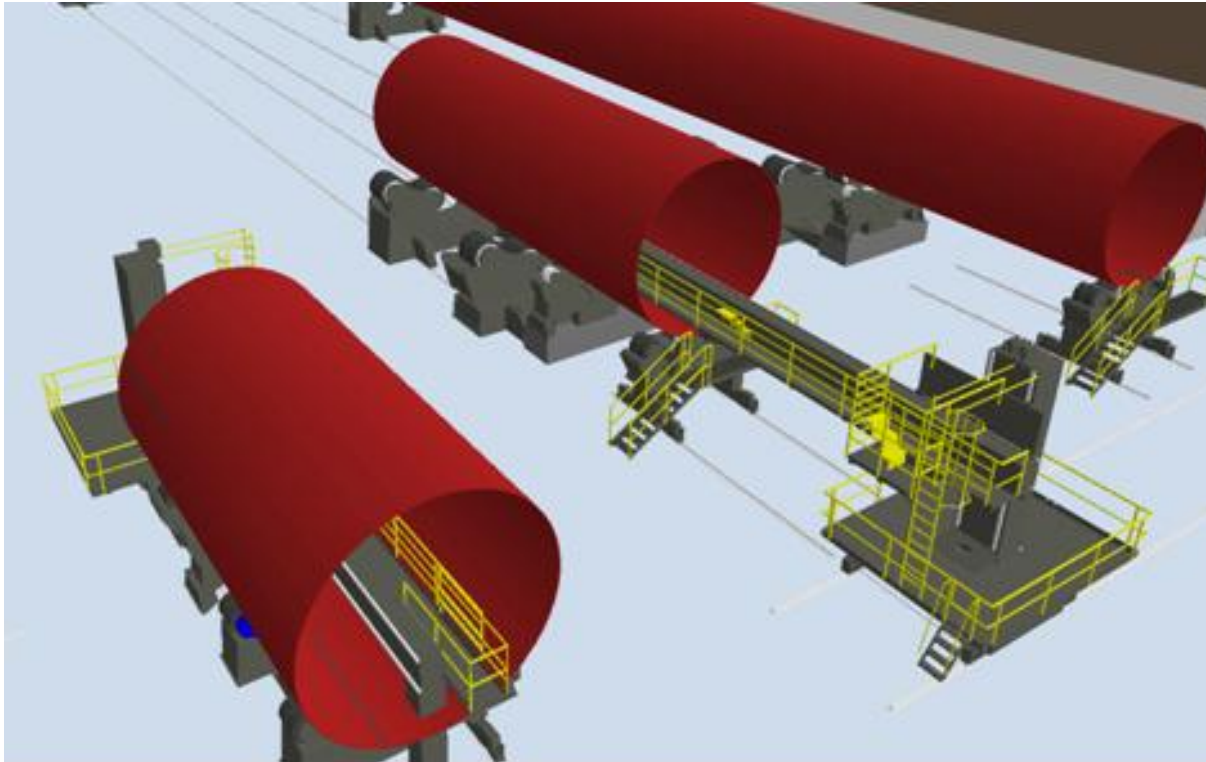
# Efficient wind tower production



## Building sections

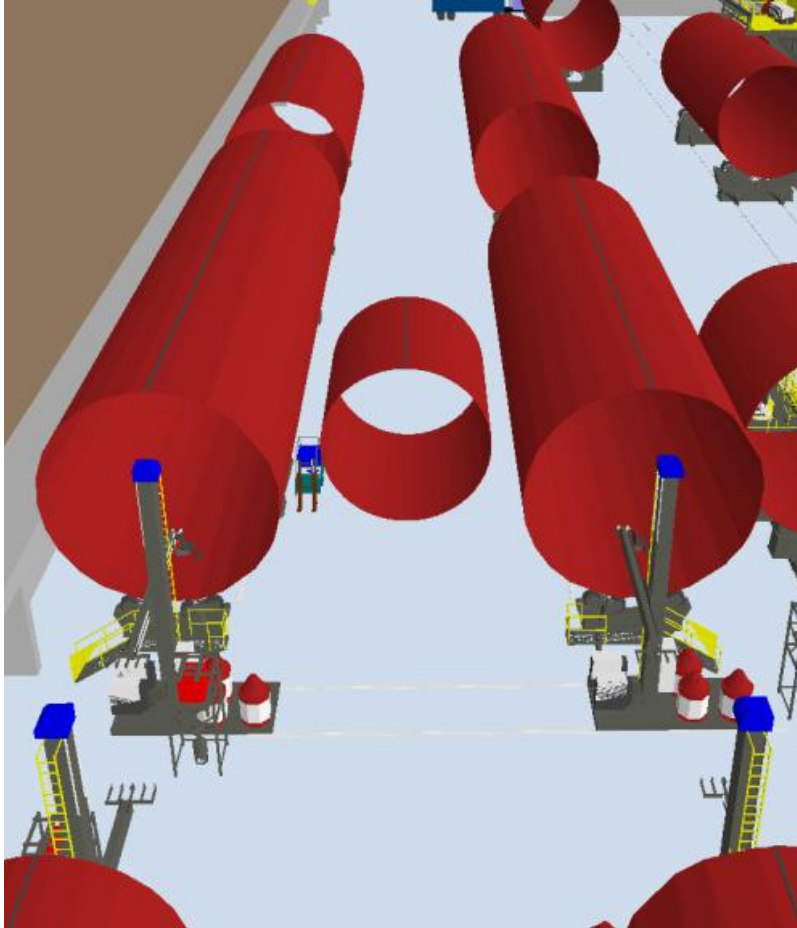
- Unique **PEMA** fit-up station and **welding manipulator** ("growing line")

# Better profitability by systematic, high-volume serial production



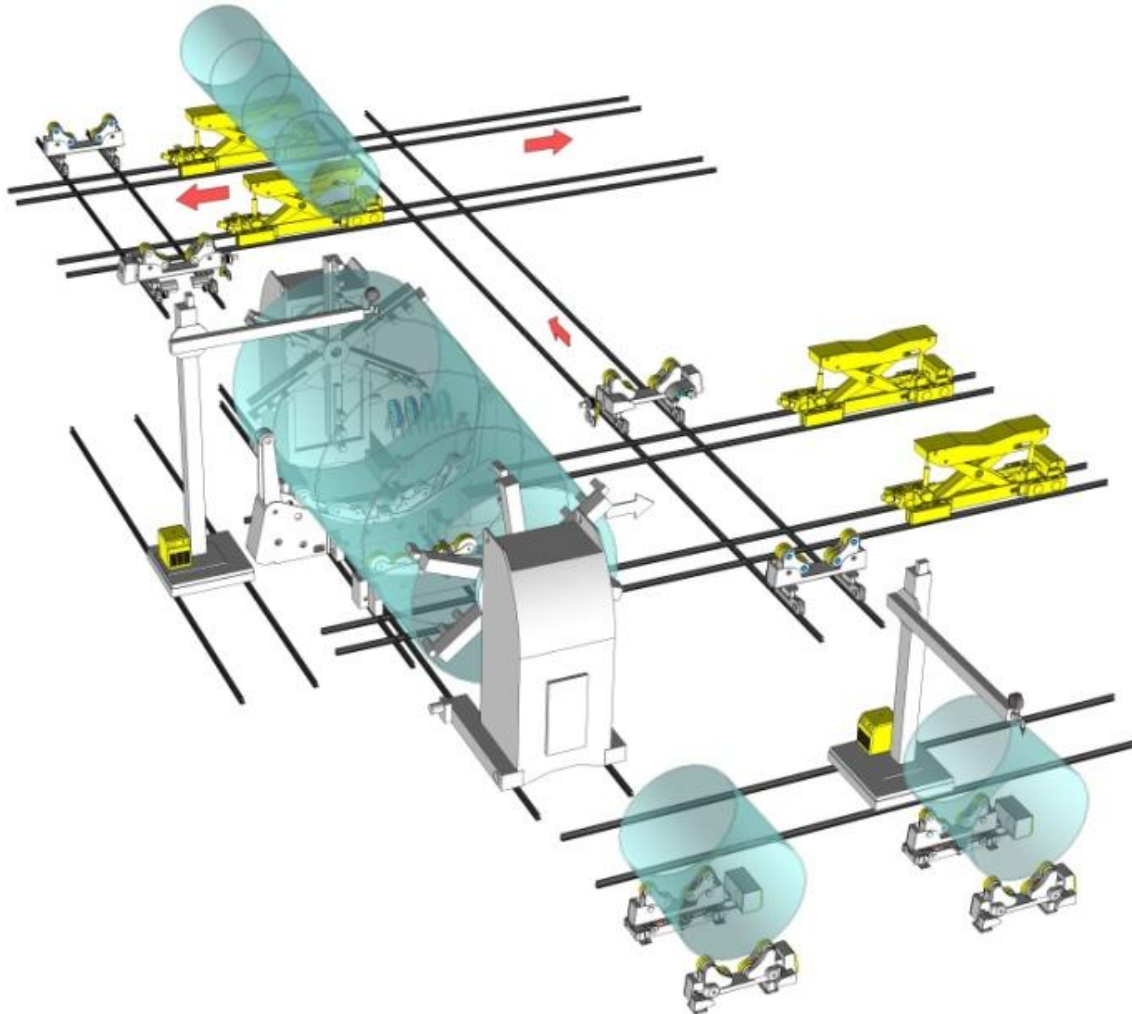
- Joining of “singles” together for forming “doubles” or “triple cans”/shells – Internal and external welding – by using special **PEMA fit-up stations**

# Better profitability by systematic, high-volume serial production



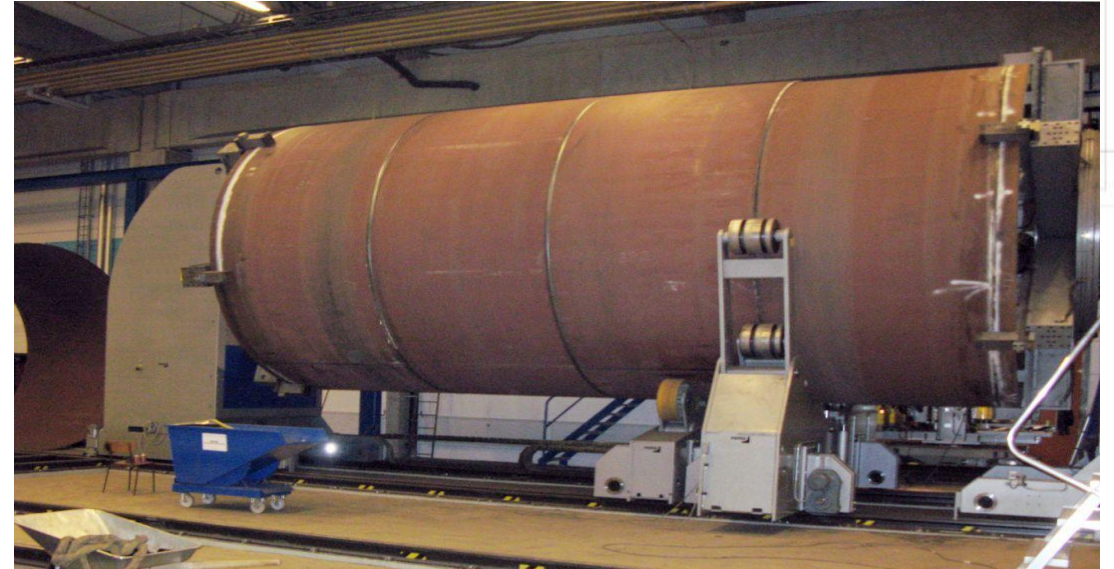
- Section building (“growing Line”) – joining “single”, “double” or “triple cans” together with **PEMA fit-up stations**

# Efficient wind tower production



## Building sections

- **PEMA Head&tailstock** with rounding jig and welding manipulator



# Efficient wind tower production

## Building sections

- PEMA Head&tailstock with rounding jig and welding manipulator

### Advantages

- Flexible operation
- Fast fit-up time
- Less space required
- Less straightness problems
- Less manpower required
- Higher welding speed

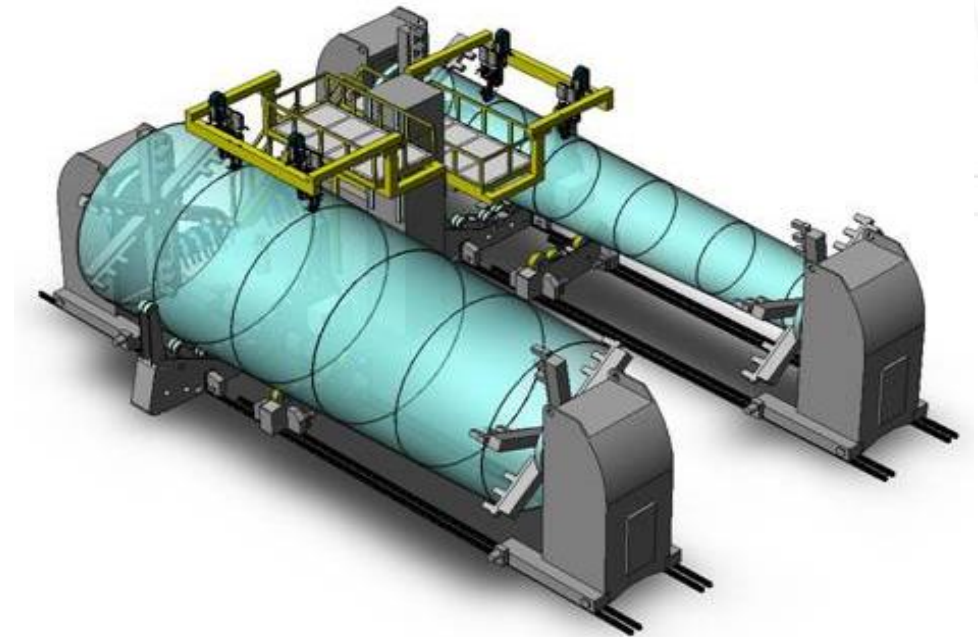
### Disadvantages

- Limited to outside welding
- Higher initial investment cost

# Efficient wind tower production

## Building sections

- **PEMA double head&tailstock** with rounding jiggs and welding tower



# Efficient wind tower production

## Building sections

- Double head&tailstock with rounding jiggs and welding tower

### Advantages

- Flexible operation
- Fast fit-up time
- Less space required
- Less straightness problems
- Less manpower required
- Very high productivity

### Disadvantages

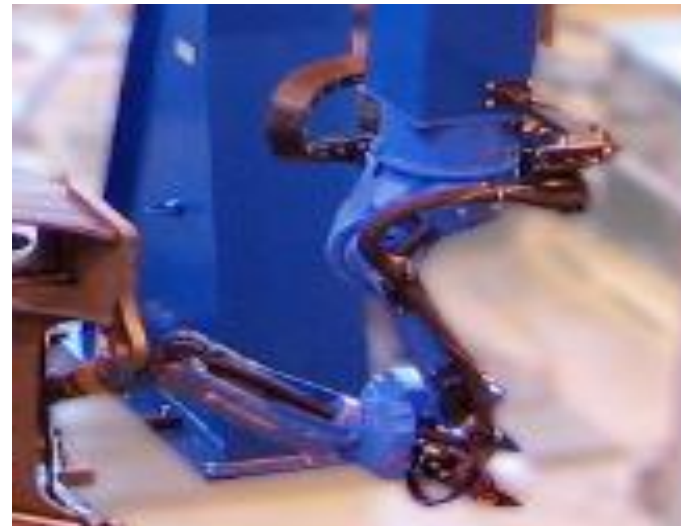
- Limited to outside welding
- Higher initial investment cost

# Efficient wind tower production

## **Welding of door frame – robot application**

One of the most time consuming individual operations in the production is the welding of the door frame.

Pemamek is researching new and more productive methods to speed up the process through robotised welding with our well known Vision system.



# Efficient wind tower production

## Blasting, metallisation and painting

The environment in these areas are extremely harsh. Not only from grids and paints but also from electrical hazard point of view. The equipment working here need to be well protected.

ATEX proof.



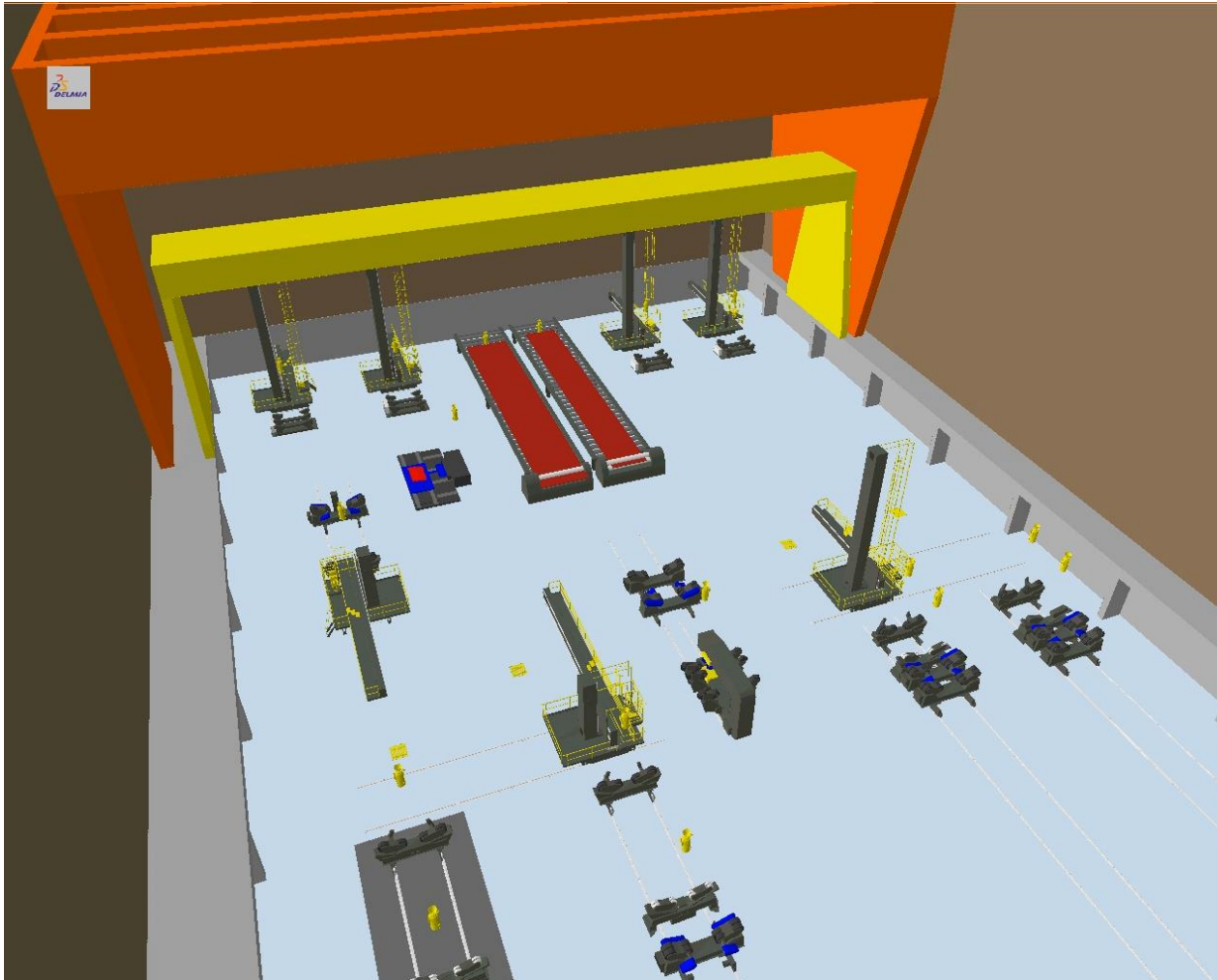
# Efficient wind tower production

## Transportation

Plates, shells and sections need to be transported inside the production hall. If overhead cranes are not available or the height is not enough all these operations can be performed on the floor.



# Efficient wind tower production



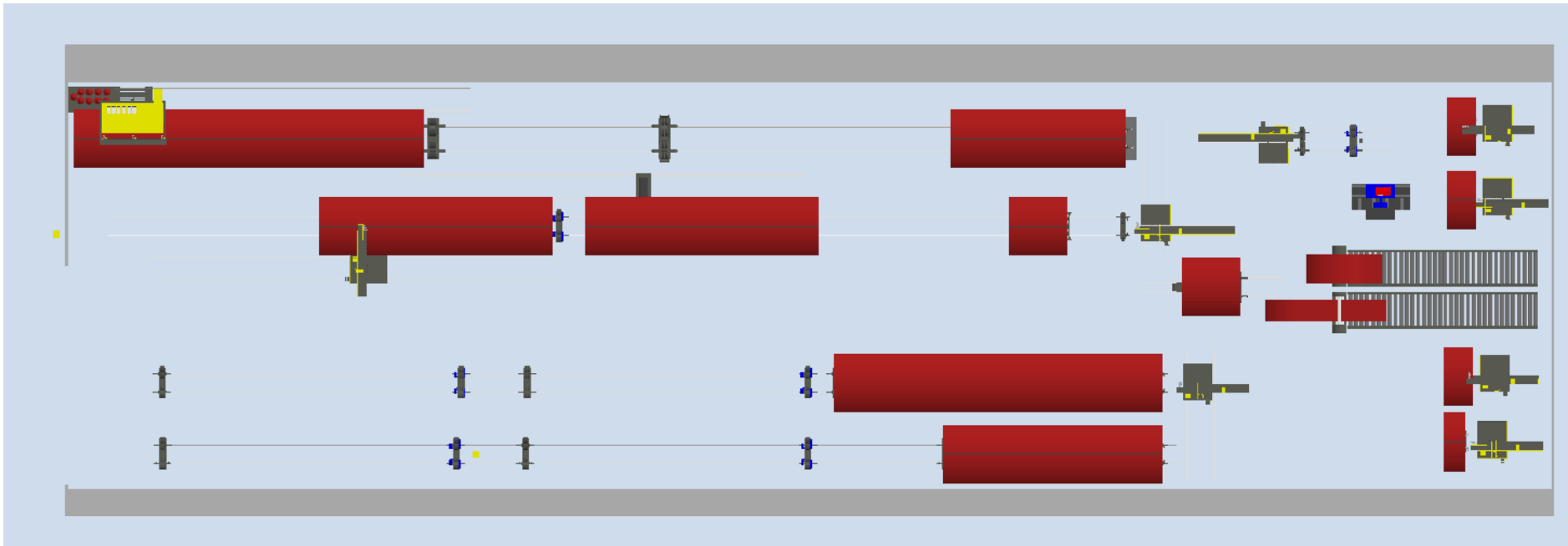
## Production flow planning

- Assisting with the total layout and solution.

# Efficient wind tower production

## Production flow planning

- Assisting with the total layout and solution.



# PEMA Business lines



Heavy engineering



Mobile machinery



Civil construction



Shipbuilding and offshore



Industrial boilers



Wind energy



Process and nuclear

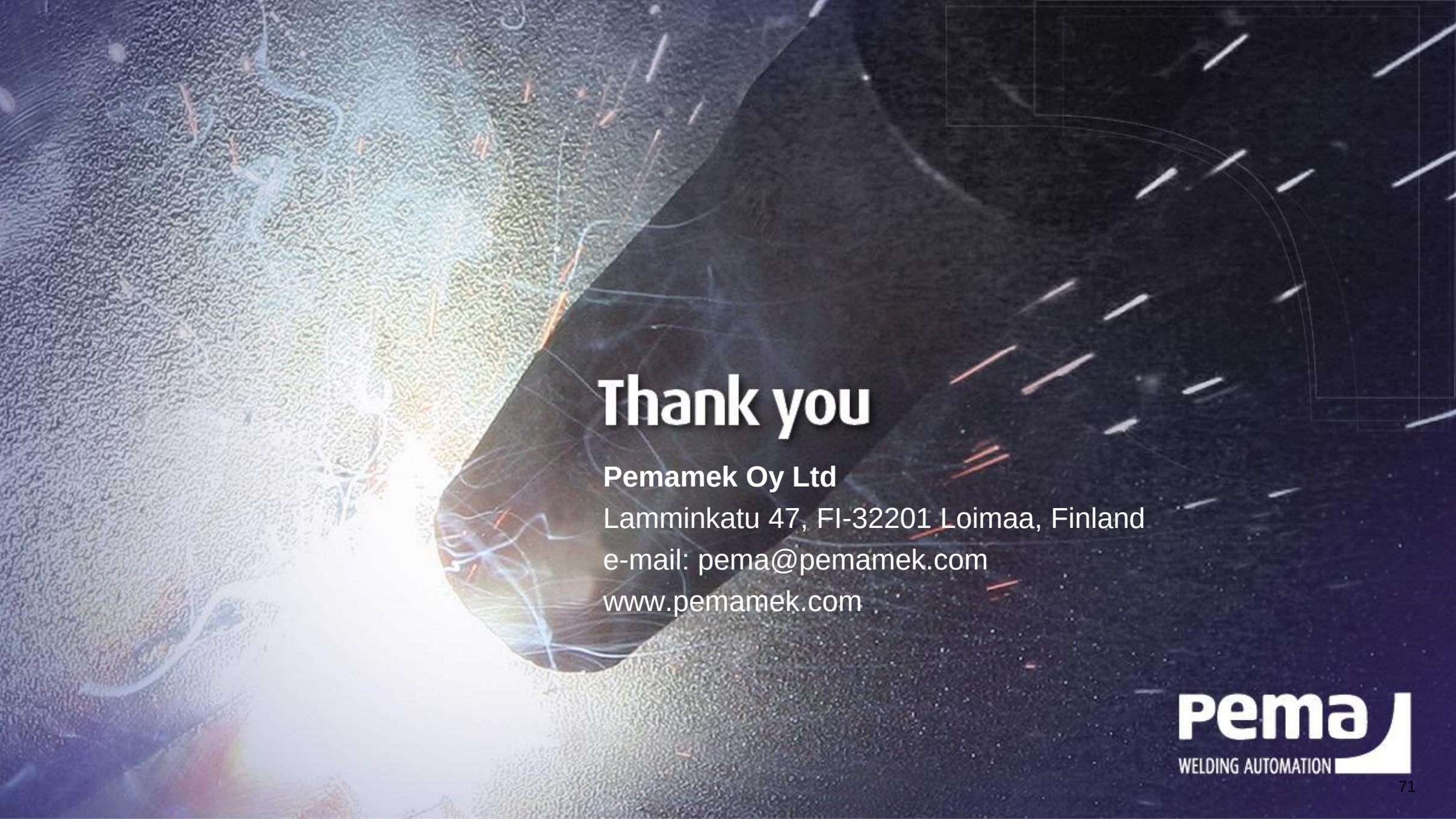


Customer support



# Maximum support for minimised downtime





# Thank you

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