

TUM Boring – Building the world's fastest TBM

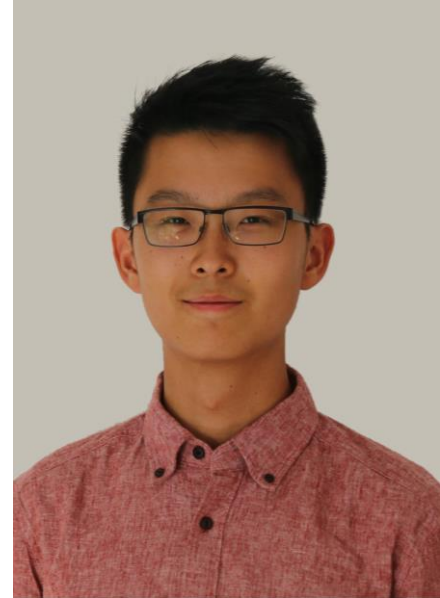
Haokun Zheng

Co-Founder, Project Lead & Chairman | @tum_boring

Today's speaker

Haokun Zheng

- 20 years old
- Undergraduate Computer Science Student at [Technical University of Munich](#)
- Co-Founder, Project Lead & Chairman @ TUM Boring



The problem

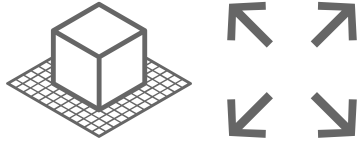
In a year, Los Angeles residents spend almost 7 full days just sitting traffic.



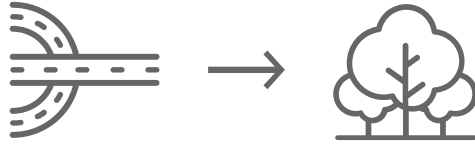
Our Goal: Revolutionize & enhance urban mobility



The importance of tunnel infrastructure



Three-dimensional infrastructure provides necessary capacity to match the growing population density



Tunnels can relieve existing street infrastructure, thereby reducing soil sealing



Tunnels enable modern mobility concepts such as Loop and Hyperloop

Not-a-boring Competition 2021

NOT-A-**BORING** COMPETITION

Las Vegas

- Announced by Elon Musk in July 2020
- **Challenge: Design and Build a Tunnel Boring Machine that bores tunnels faster than a snail crawls**

Competition Tunnel requirements:

- 30m (98ft) length
- 500mm diameter
- 1,5m (5ft) deep

Fastest team to complete the tunnel wins





The TUM Boring Team

TUM Boring

The 2021 Team of the Technical University of Munich

60+

Students

From 16 different
countries

24

Years

Average age

16+

University Faculties

Represented by
our team
members

14

Months

From project
inception until
finished machine

Project Patron

Prof. Dr. Thomas F. Hofmann

President of the Technical University of Munich

“ (...) I am convinced that we will succeed and I wish our team the greatest possible success. All of TUM is behind you 100 percent!”



Strong industry support

Many leading industry partners follow and support us on our journey to Las Vegas, enabling us to participate with a competitive machine.



Autodesk as a corporate partner and sponsor has played a major role in supporting us financially as well as through in-kind support.



High media attention

We have been featured in all major German Newspapers

Süddeutsche Zeitung

Handelsblatt

Frankfurter Allgemeine

ZEITUNG FÜR DEUTSCHLAND

Münchner Merkur

BUSINESS INSIDER

BR

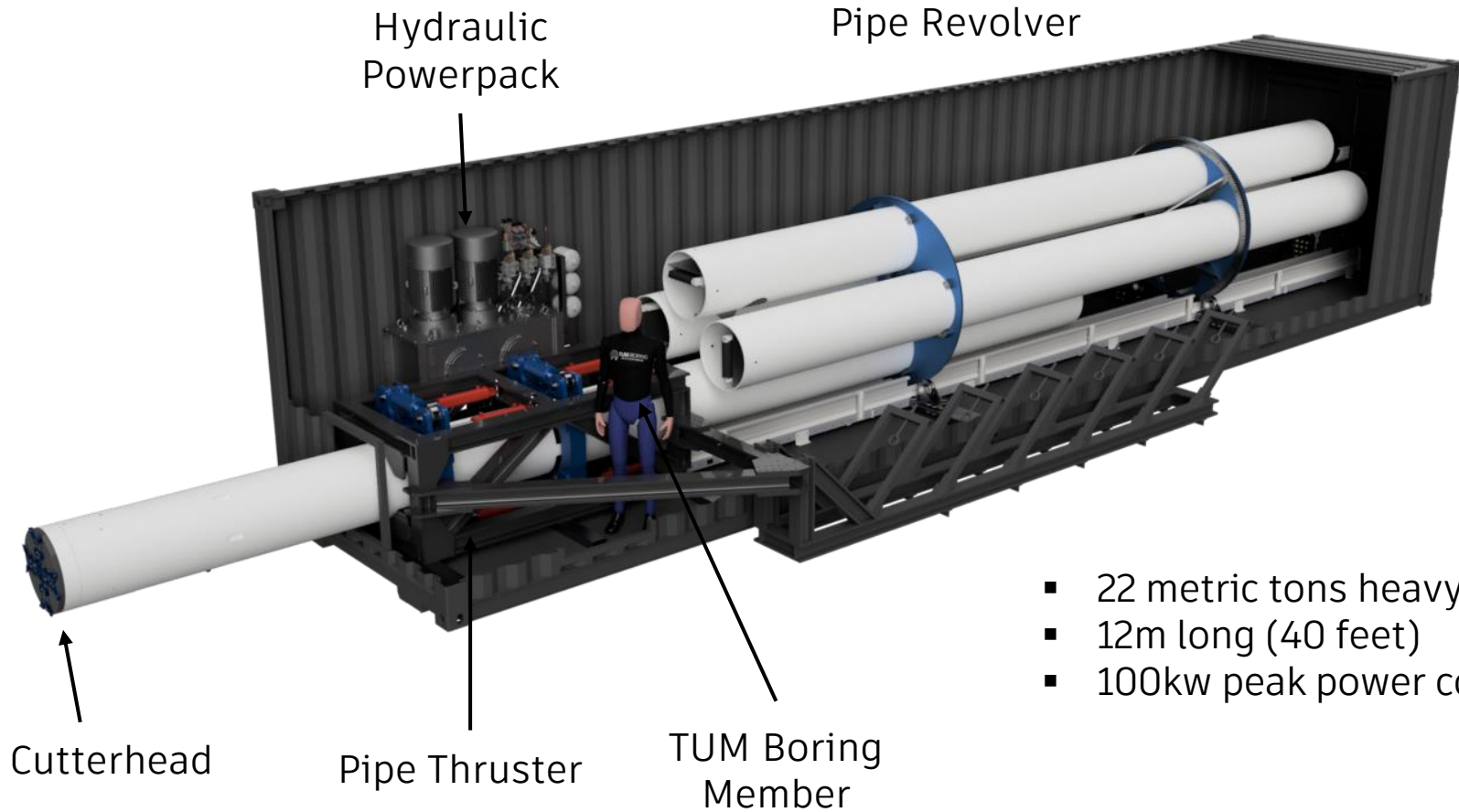
Accumulated readership of over 10,6 Mio per issue

Over 700 000 organic impressions through our Website and Social Media Channels

Our Machine



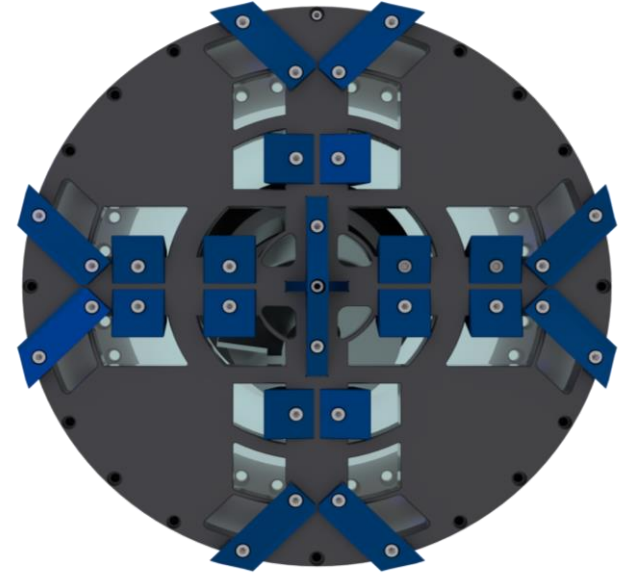
Technical Concept



- 22 metric tons heavy
- 12m long (40 feet)
- 100kw peak power consumption

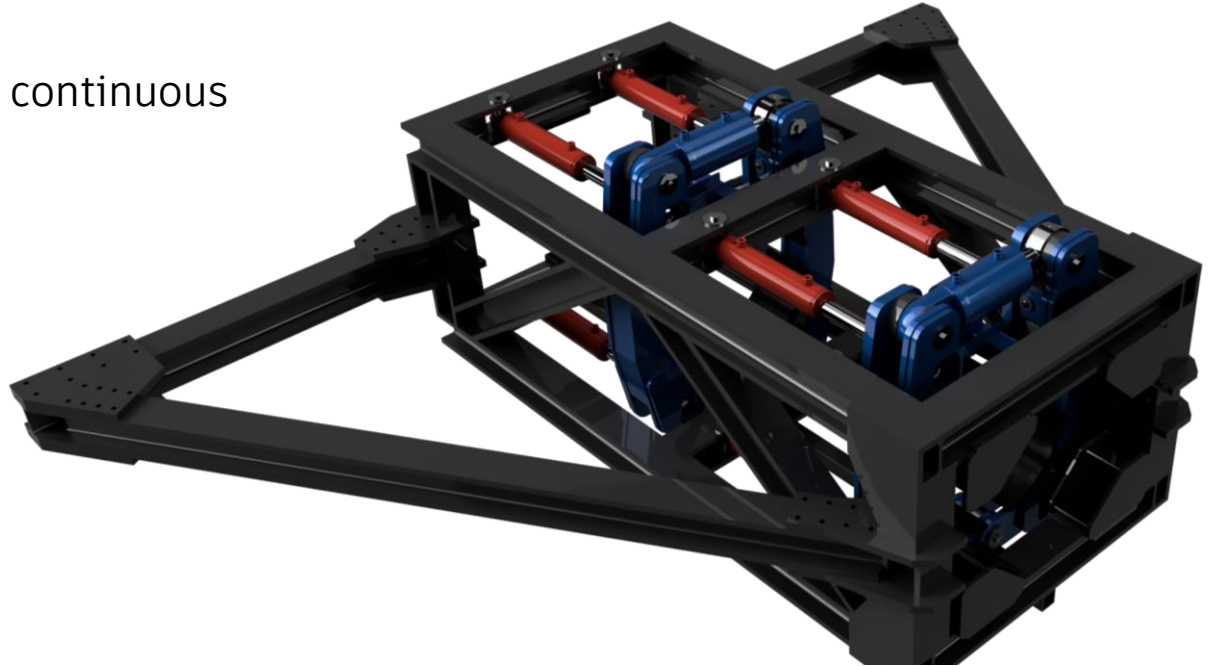
Technical Concept - Cutterhead

- Peak Torque of 10.000 Nm at ~30 RPM
- Optimized for Las Vegas geology
- Full electric drivetrain



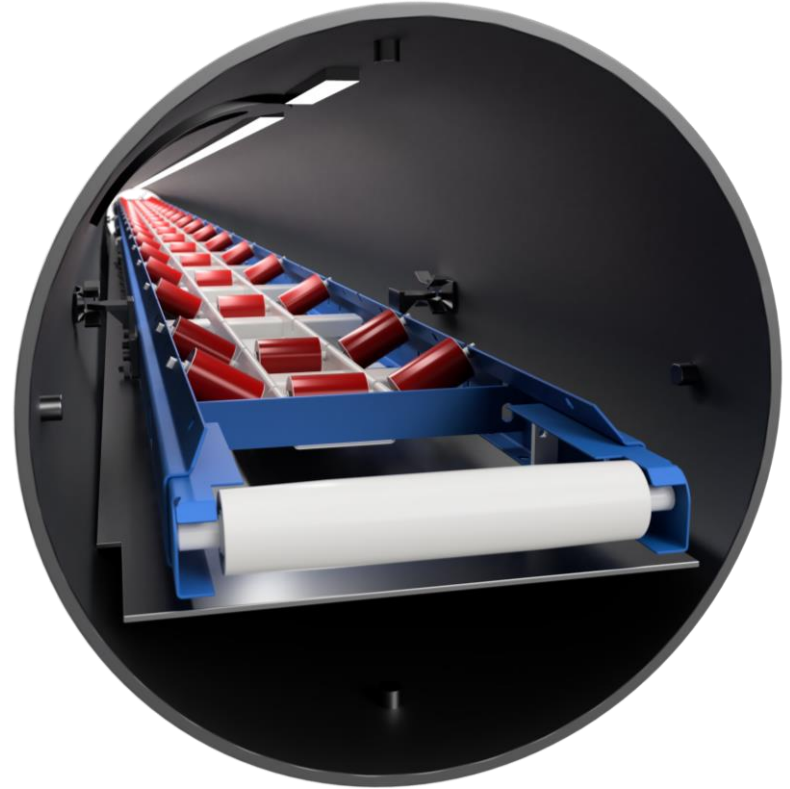
Technical Concept – Pipe Thruster

- Pushing forces of up to 100 metric tons
- Feed rate of up to 1m/min
- 2 Hydraulic circuits enable a continuous tunneling process

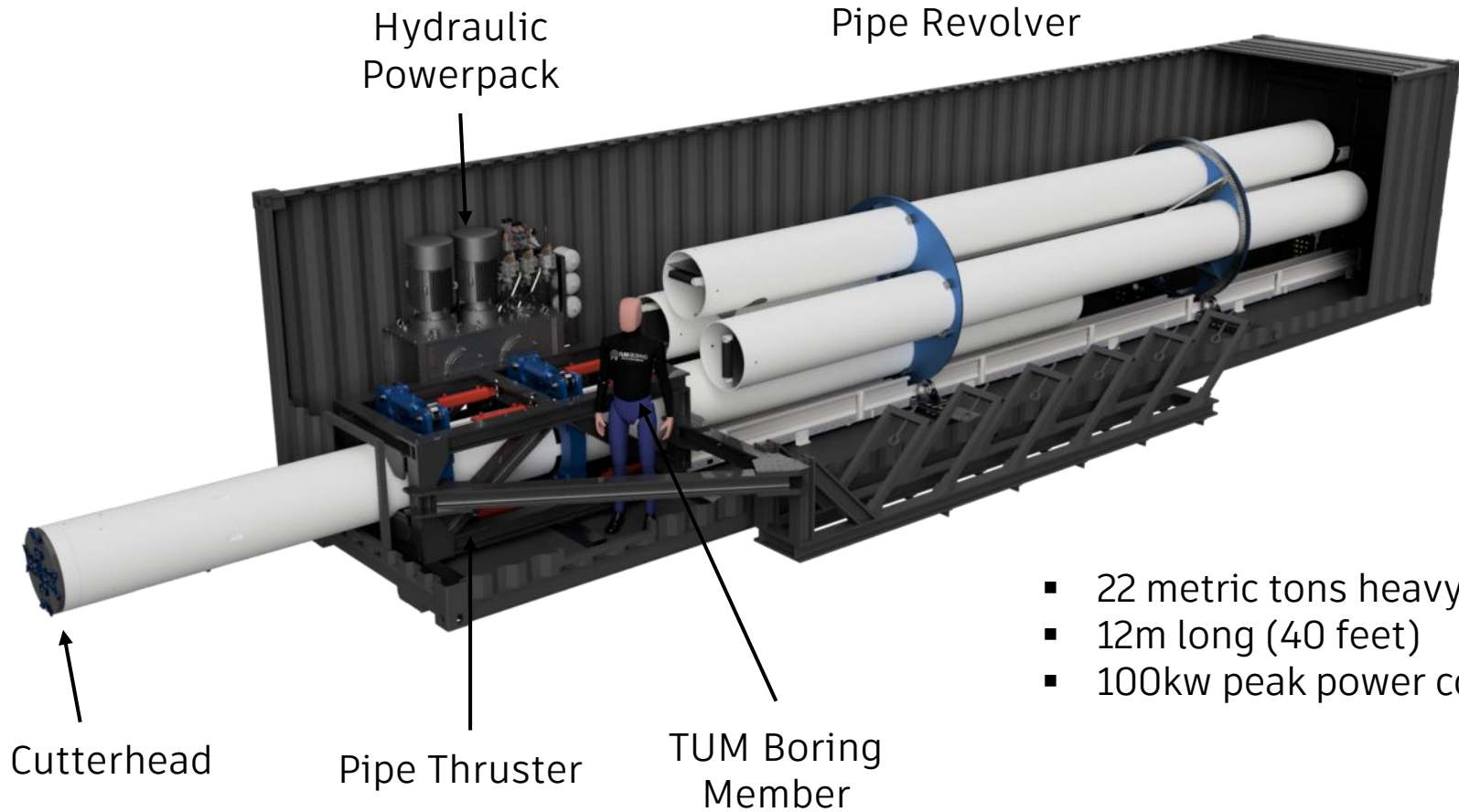


Technical Concept – Material Removal

- 55m of conveyor belts (180ft)
- Material flow rates of up to 8kg/s
- Low power consumption electric drivetrain



Technical Concept



- 22 metric tons heavy
- 12m long (40 feet)
- 100kw peak power consumption

Project timeline

From Project Inception in July 2021 to the Competition in September 2021

July 2020

**Project
inception & Start
of Design Phase**

Recruitment of
60 people

Feb 2021

**Start of
Assembly**

Qualification for
Competition
Finals as one of
12 out of 390

May 2021

Start of Testing

Successful
digging of 30m
test tunnel

Aug 2021

**Shipment of the
machine to
Houston**

Machine leaves
Houston for
Vegas after final
preparations

A group of five young men are sitting around a glass-topped table in a workshop or office environment. The man on the far left is wearing a grey patterned long-sleeve shirt and blue jeans. The man next to him is wearing an orange t-shirt. The man in the center is wearing a grey hoodie with 'DAD' on it. The man next to him is wearing a black t-shirt with 'Sponge' on it. The man on the far right is wearing a dark blue t-shirt. On the table, there is a white cylindrical object with 'TUM BORING' written on it, a laptop, a water bottle, and some snacks. In the background, there are shelves with various items, a large painting of Iron Man on the wall, and a blackboard with some drawings. The text 'Project Inception' is overlaid in the center of the image.

Project Inception

How everything started

Our first prototype



How everything started

Our first prototype





Weekly hours spent in Fusion 360



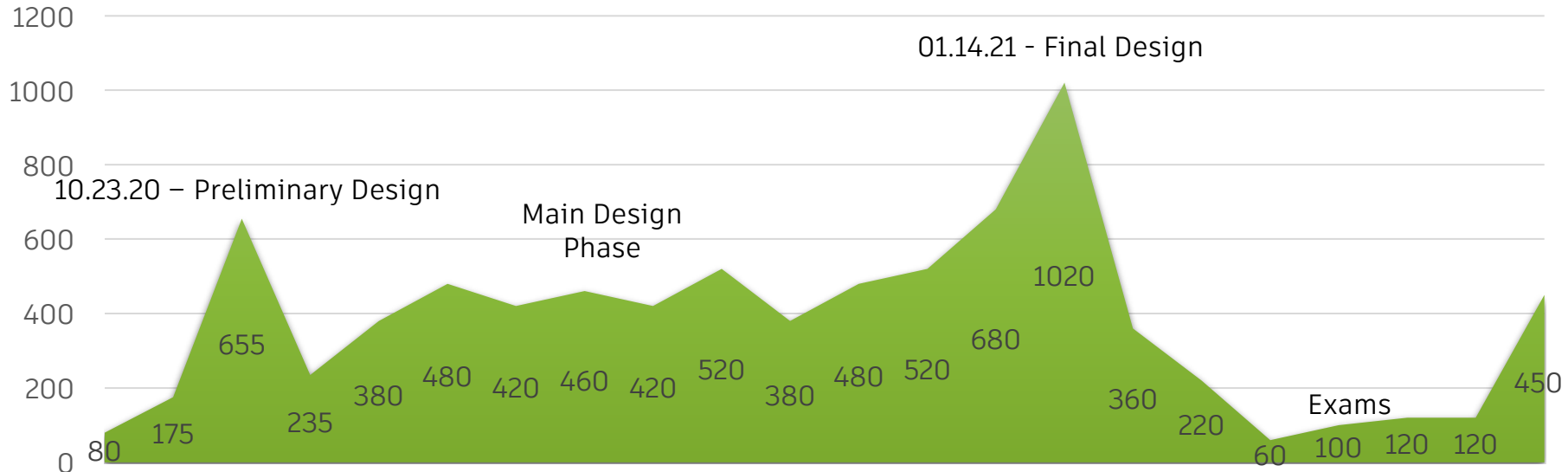
Over 20 TUM Boring Members are working with Fusion 360 on a daily basis



Our machine consists of 10000+ Parts (Bodies)
(Counted via count function in the full assembly 10072)



> 6500 accumulated hours spent in Fusion 360 since September 2020



Assembly start

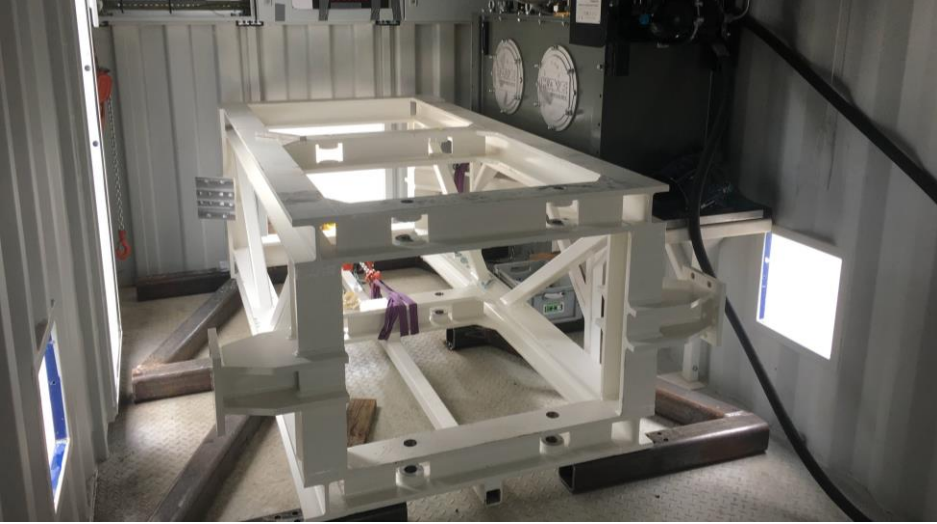
A group of construction workers wearing high-visibility safety vests are walking away from the camera on a wet, reflective industrial site. In the background, there are large industrial buildings, a blue container on a truck, and various construction equipment. The scene is overcast and appears to be in winter or early spring.

STRABAG

MAGAZIN
WARENANNAHME

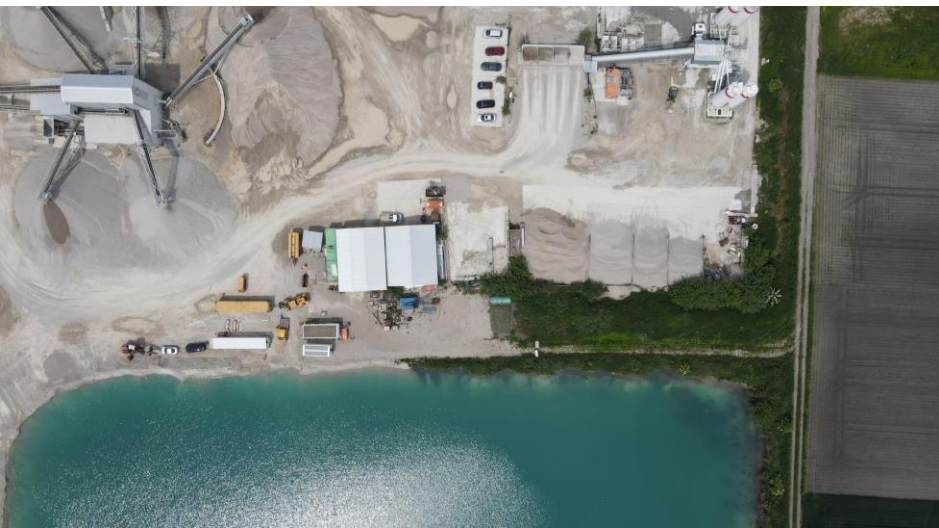






Moving to the testsite



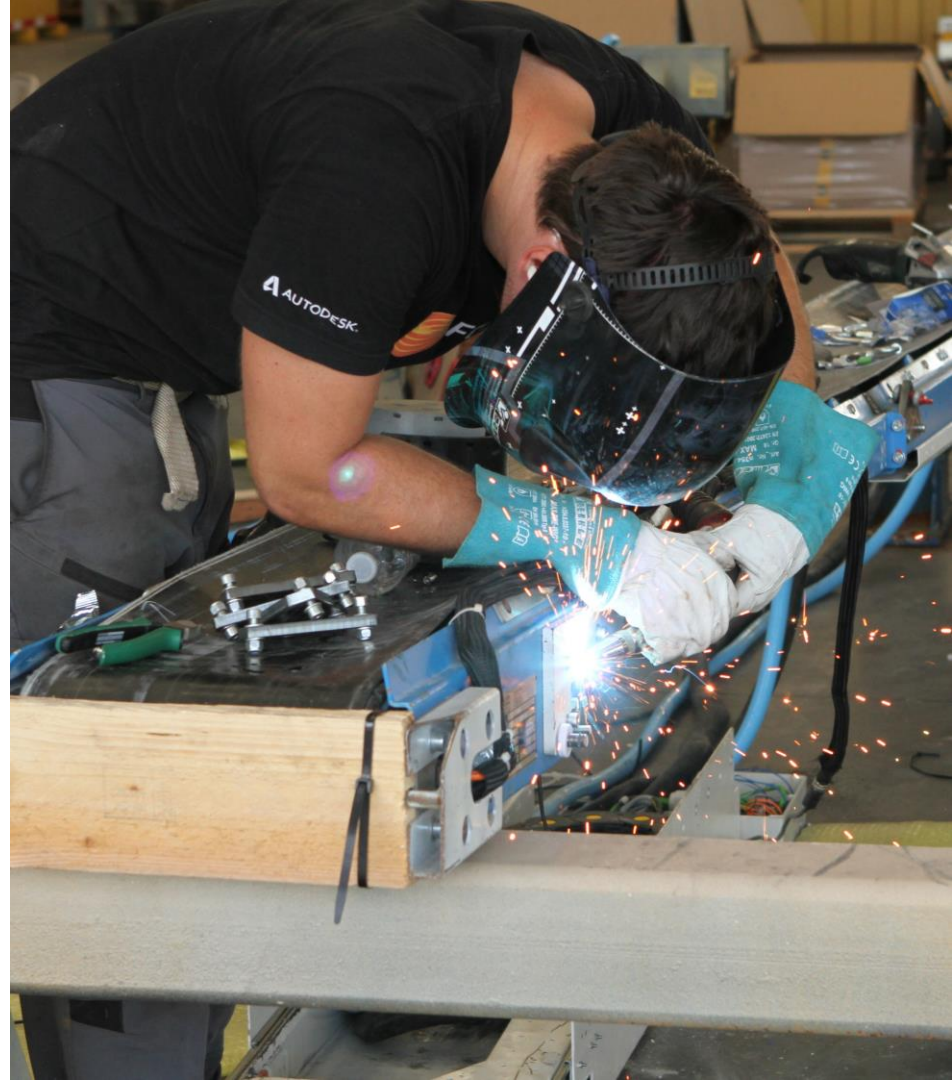
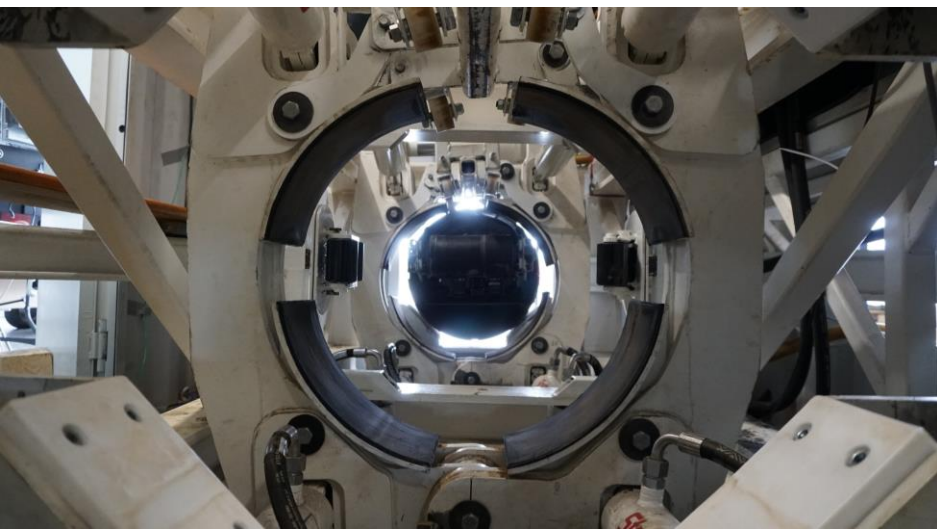






Machine arrives in Houston







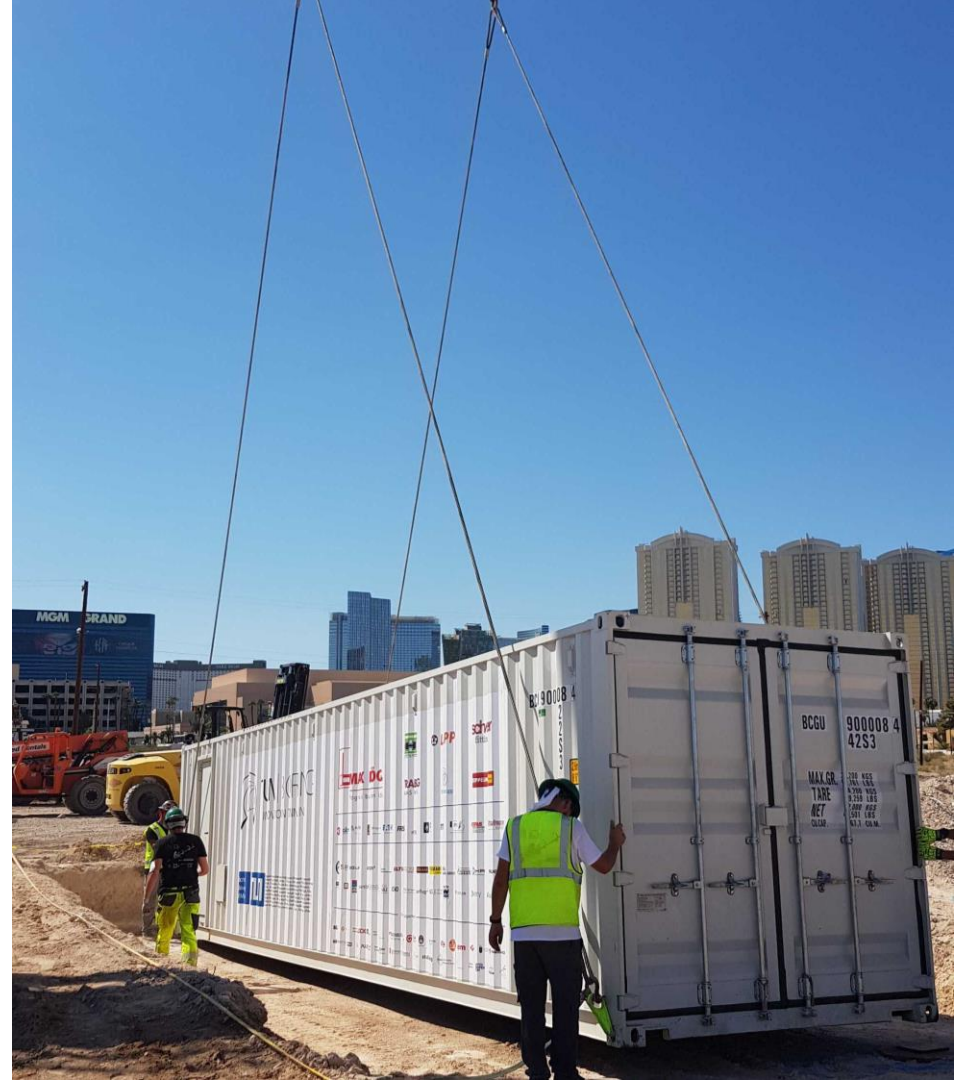
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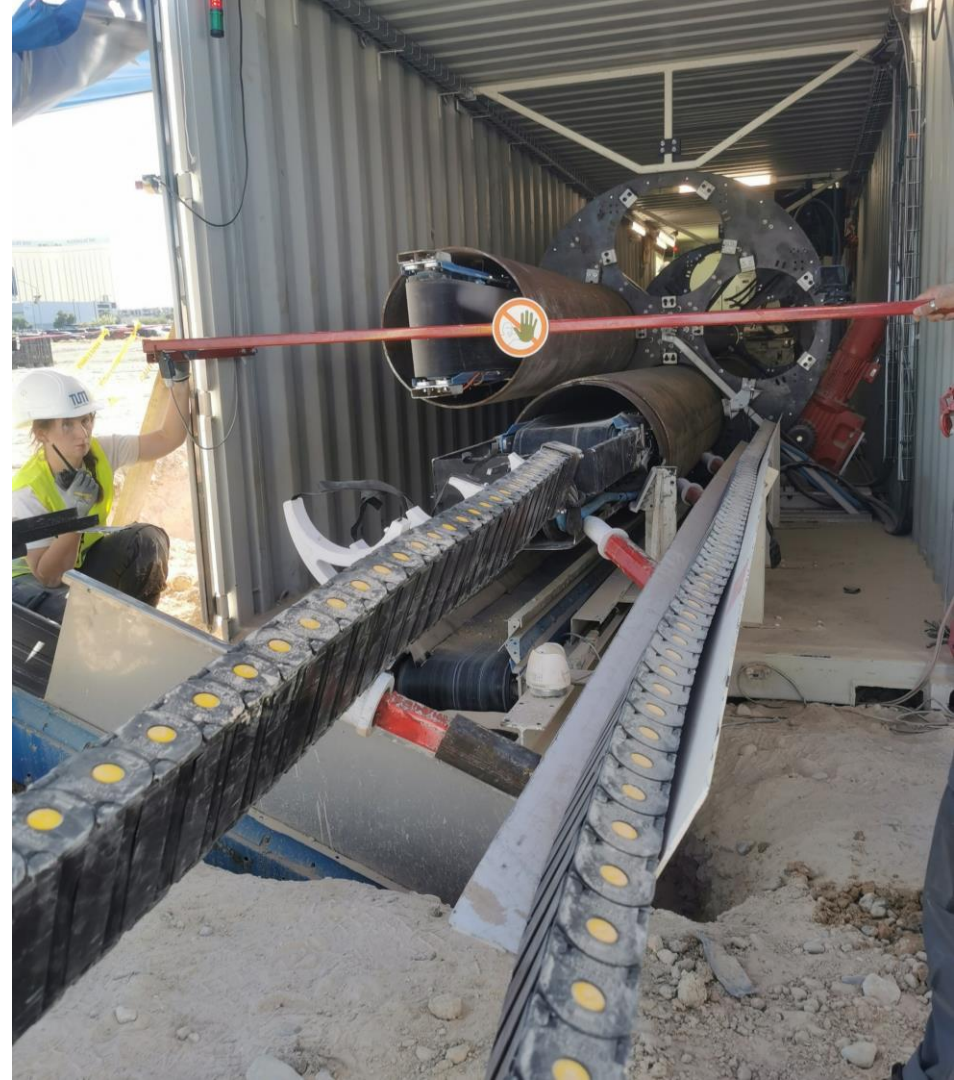
Competition Finals in Vegas













**And after 6h of
tunneling...**

TUM Boring wins the 2021 Not-a-Boring Competition!

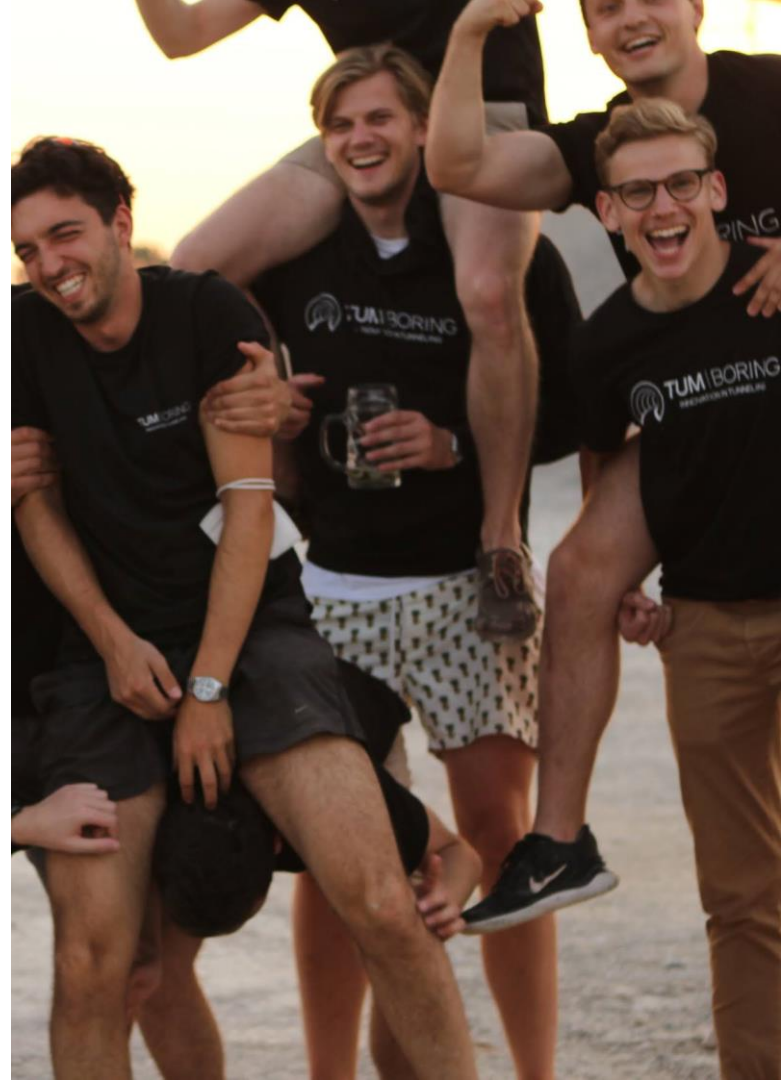


Learnings



The power of passion

- Passion and motivation can make anything possible.
- Without the sincere dedication of each individual team member, we wouldn't have been able to even remotely get this far



Effective deployment of remote working tools

- Online conferencing and workspace communication allowed for very high work efficiency
- Fusion 360s cloud feature proved to be vital –
Deploying the right software can save valuable time



The world needs more projects like this

- The learnings and takeaways from such a project are an incredibly valuable and irreplaceable addition to an academic degree
- Dedicated and passionate high intensity projects like this drive technological innovation and gather attention a dedicated technical field.



Thank you for your attention!

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TUM Boring Website:

<https://tum-boring.com/>

The background of the slide features four abstract, dark gray, three-dimensional geometric shapes in the corners. These shapes resemble stylized, faceted crystals or architectural elements, each with sharp edges and reflective surfaces that catch the light, creating bright highlights and deep shadows. They are positioned in the top-left, top-right, bottom-left, and bottom-right corners, framing the central text.

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