NEXT GENERATION OF WATER JET CUTTING AND EROSION TECH

wellANT

Version 2.0– June 2023

Agenda

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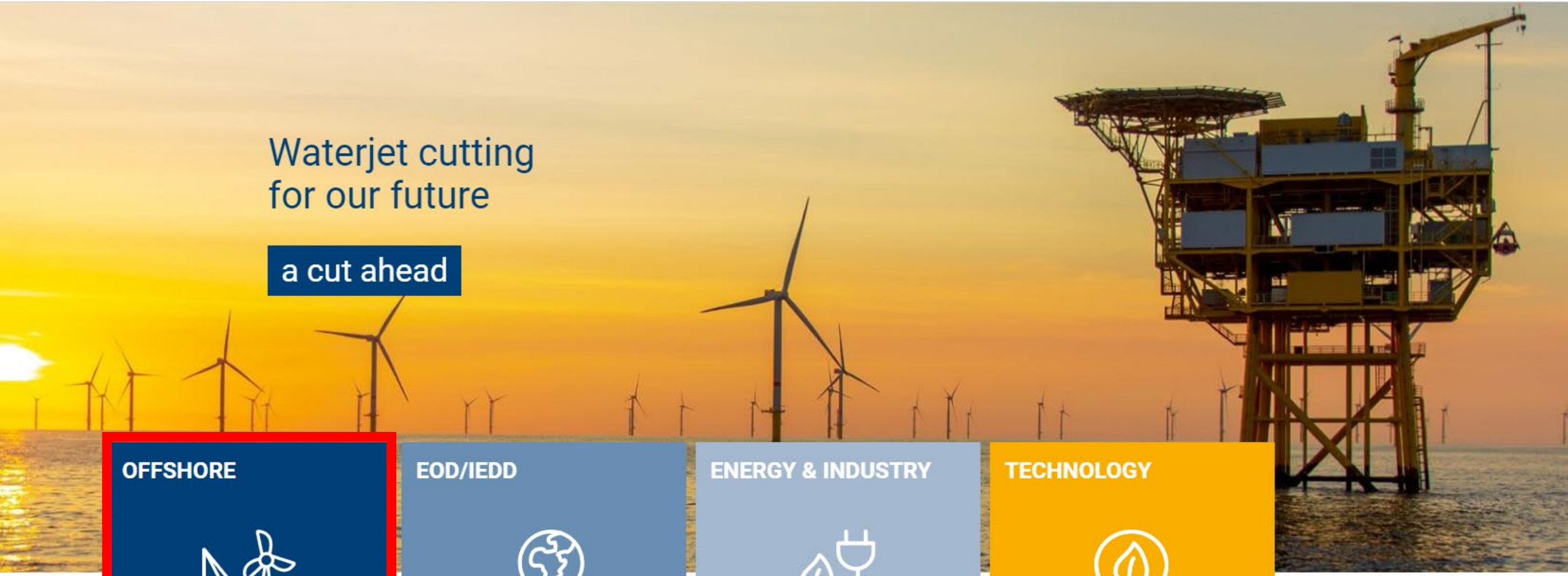
- Who we are & what we do
- The Hisotry of ANT

02

- wellANT
- What is wellANT
- Tech Specs
- The system
- Test exapmples
- Erosion rates
- Whats next
- Review , Q&A

What we do



OFFSHORE

Decommissioning, P&A, production enhancement

EOD/IEDD

Safe disarming

ENERGY & INDUSTRY

Sustainable cutting and erosion

TECHNOLOGY

Innovation with water and abrasive

Who we are – the History of ANT

1999 2001 2005 2013 2017

Founded in Lübeck as specialists for **mobile** Water Abrasive Suspension (WAS) jet cutting and special purpose machinery

Mobile units for bomb defusing (EOD)

Mobile units for decommissioning (NUCLEAR)

Mobile units for decom & dismantling (OFFSHORE)

Global technology leader of mobile WAS cutting systems

Development of a continuous WAS system for **stationary** cutting

ConSus® for Processing industry

Who we are – the History of ANT

Continuous R&D supported by ANT‘s network

Universities

- Institute of Geonics, Ostrava, Dr. Josef Foldyna (Deputy Director for Science & Research)
- Technical University Chemnitz, Institute for machine tools and production processes
- UWTH (Under Water Technical Area) Hannover, Water Jet Technology
- University of Missouri Rolla
- Fraunhofer-Institute Chemical Technology, RoBEMM
- Geomar (RoBEMM, UDEMM)
- Bochum University of Applied Sciences, School of Geothermal Technology,
  Dipl.-Ing. Volker Wittig

Expert

- Dr.-Ing. Frank Pude – Steinbeis-Beratungszentrum Horgau, Water Jet expert

Memberships

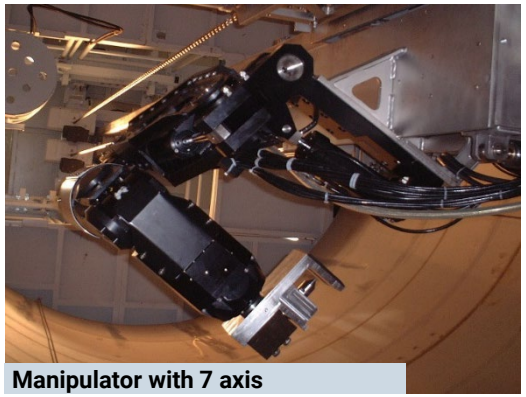
- AWT
- WJTA – Waterjet Technology Association

Fields of Business

Cutting Devices

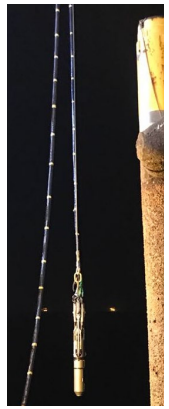
- EOD
- Industry / Nuclear
- Offshore

Cutting the base plate of a bomb

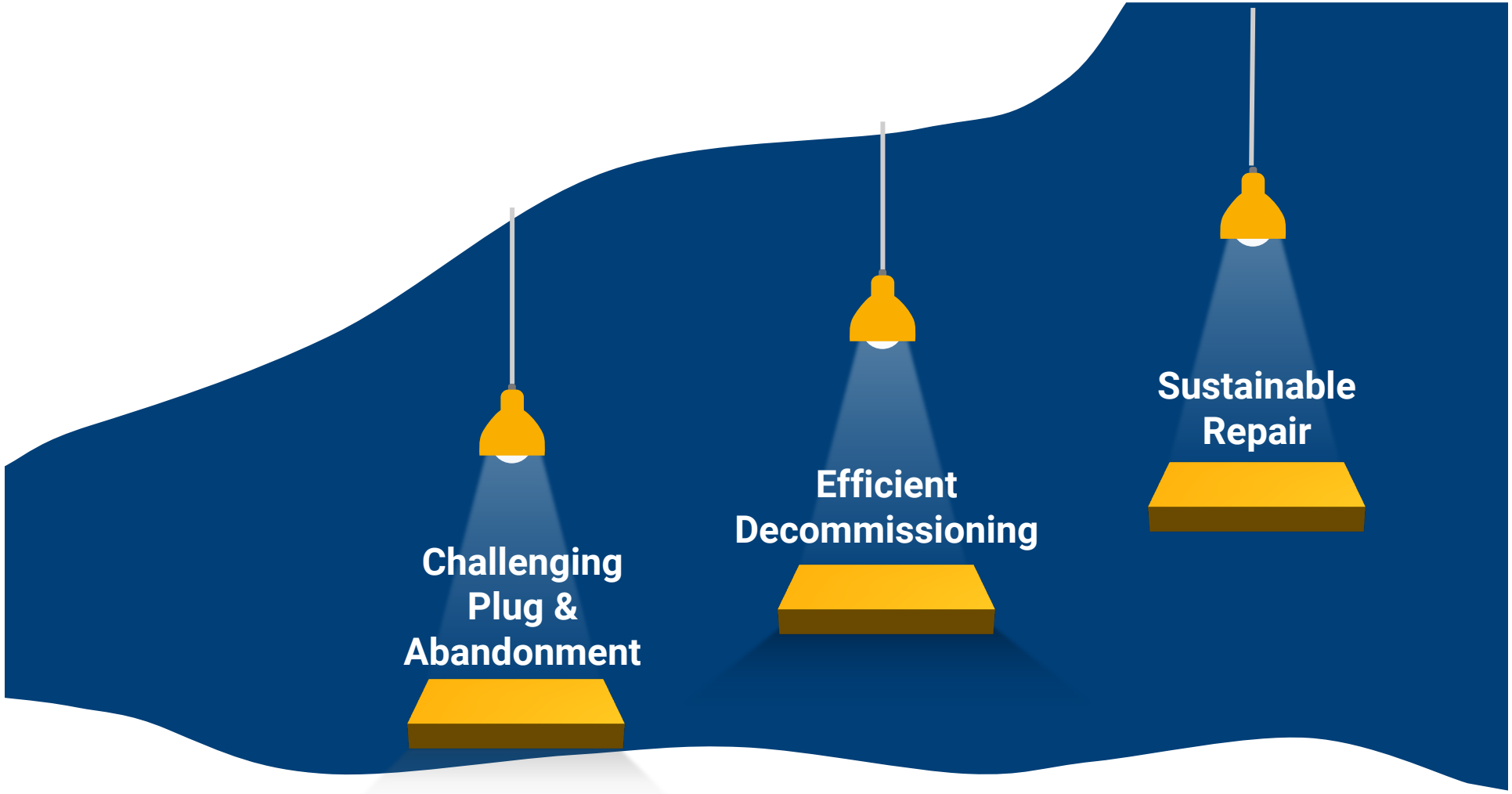


Manipulator with 7 axis

Internal well cutting with DCH



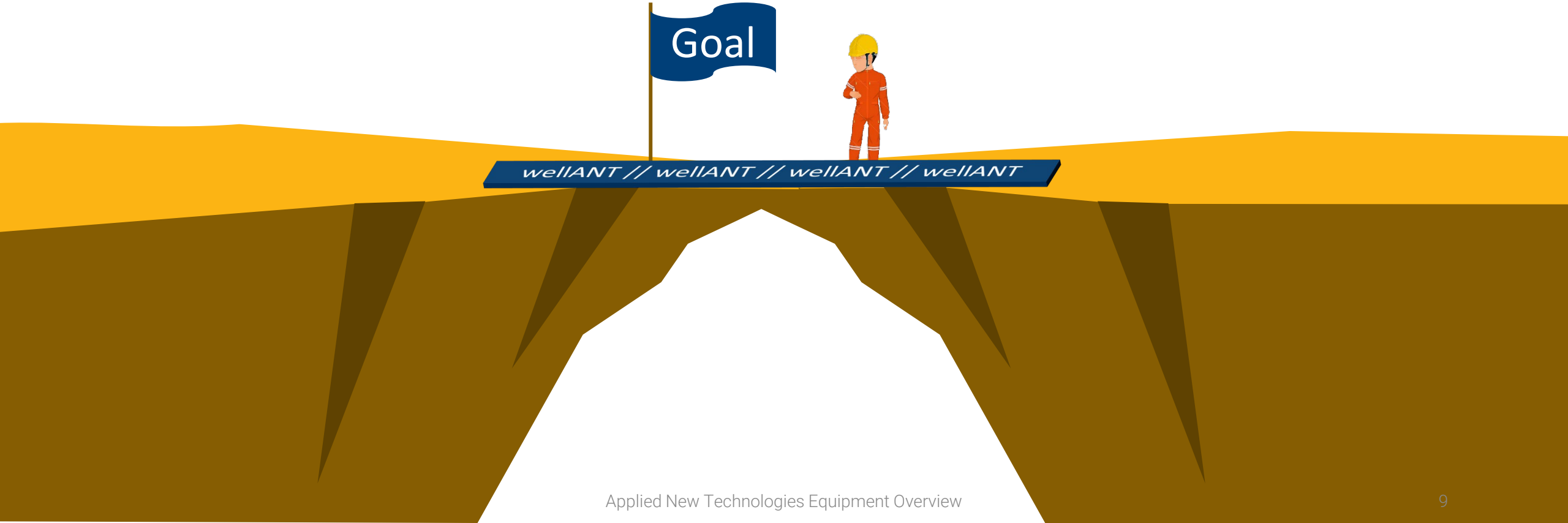
Your Challenge



wellANT:
Revolutionizing technology for P&A

We understand some of your challenges to generate access to the well bore!

- Collapsed wells - restrictions
- Stuck objects - plugs, packers, etc




wellANT

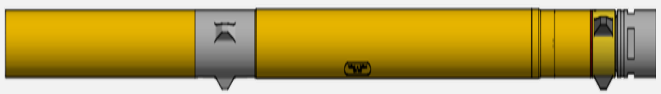
wellANT Video

Technical details of wellANT

Stroker Module

133“ (3.380 mm)
Tool diameter: 2 7/8“ (75mm)

Weight	72 kg
Axial Speed	max. 3 mm/min
Axial movement	max. 400 mm
Interface	2 3/8“ PAC DSI

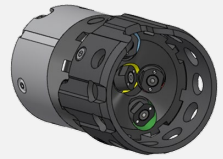


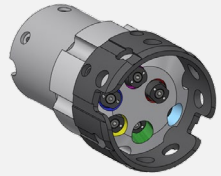
Rotation Module

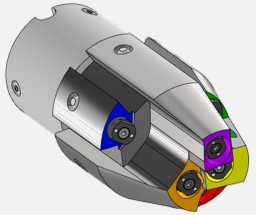
75“ (1.890 mm)
Tool diameter: 2 7/8“ (75mm)

Weight	44 kg
Mud flow	max. 100 gpm
Diff. Pressure	max. 7250 psi
Speed	max. 3 rpm
Torque	max. 70 ft lb
Interface	2 3/8“ PAC DSI

Nozzle Heads





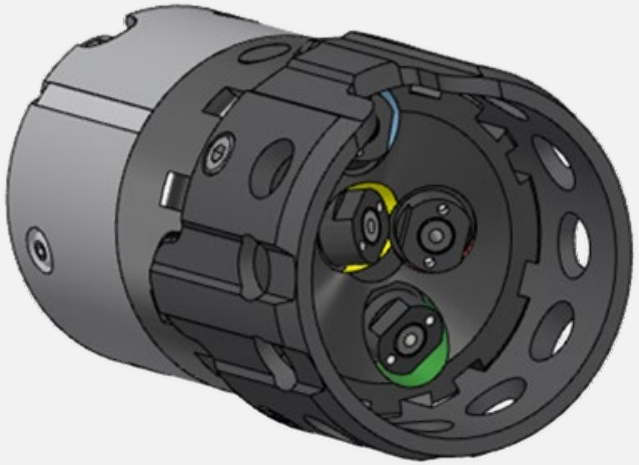


Standard parameters: max 450 bar (6500psi) @ 450 l/min (100 gpm)

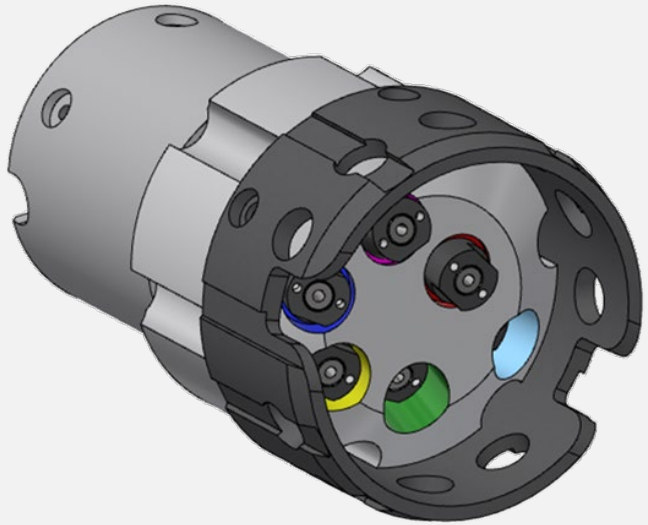
Optional/Additional modules available:

- Anchor Module
- Circulation Sub

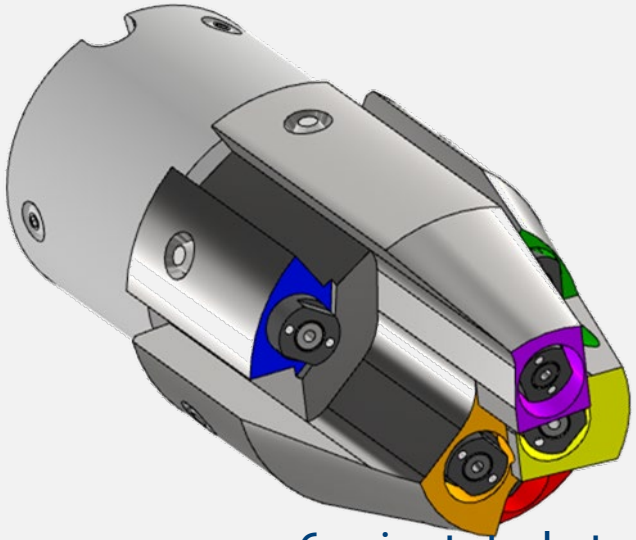
Nozzle Heads of wellANT



4 orientated nozzles



6 orientated nozzles



6 orientated stepped nozzles

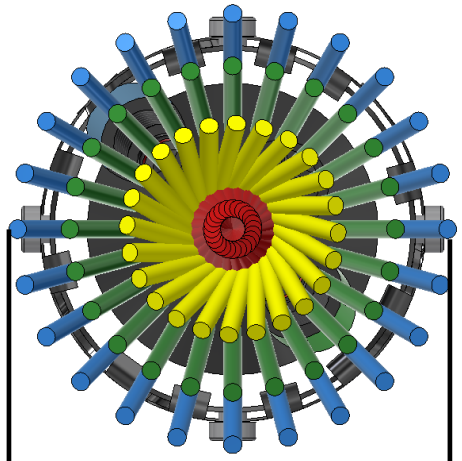
Several Nozzle Heads for your application are already available but if necessary can be individually developed or adapted

Nozzle Heads of wellANT

Nozzle Head Design – Standard Head

1) Calculated nozzle configuration

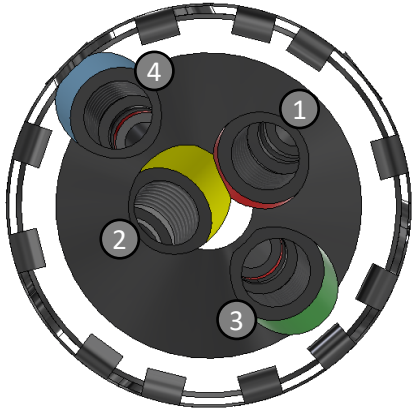
Standard Nozzle Head



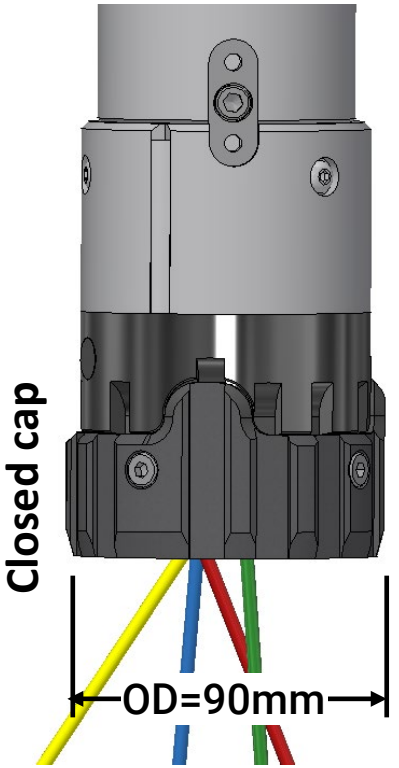
Constant Movement => with stroke

390 bar @ 430 lpm

(5773 psi @ 118gpm)



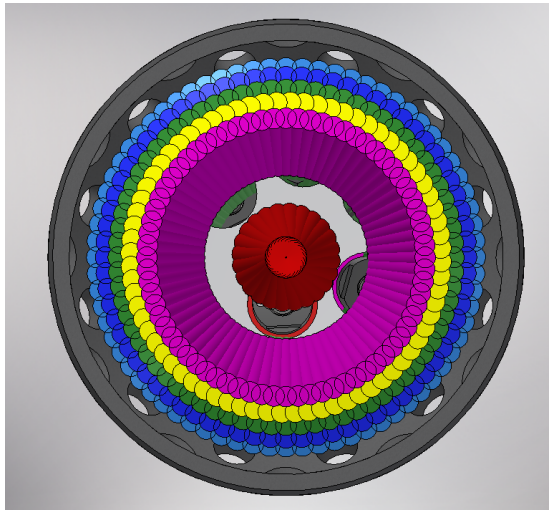
Nozzle #	Ø
Nozzle 1 (red)	2,2
Nozzle 2 (yellow)	3,2
Nozzle 3 (green)	3,2
Nozzle 4 (cyan)	3,7



Nozzle Heads of wellANT

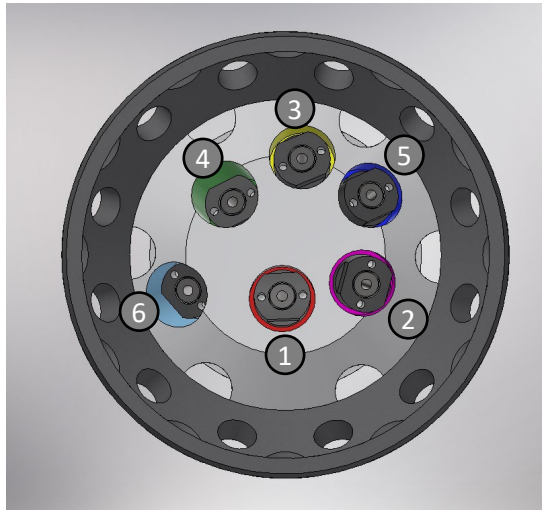
Nozzle Head Design – Classic Head

1) Calculated nozzle configuration



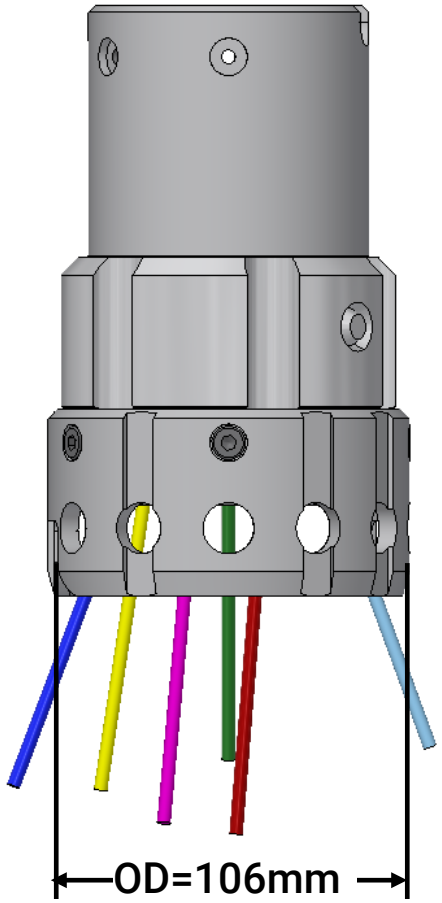
OD=120mm
Erosion OD

Constant Movement => with stroke



Classic Head	Ø
Nozzle 1 (red)	2,2
Nozzle 2 (magenta)	2,2
Nozzle 3(yellow)	2,5
Nozzle 4 (green)	2,2
Nozzle 5 (blue)	2,2
Nozzle 6 (cyan)	2,8

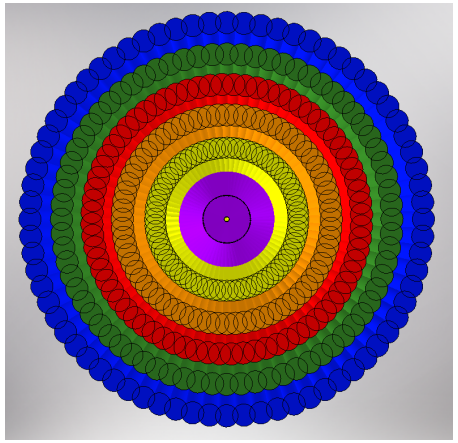
425 bar @ 385 l/min
340 bar @ 340 l/min



Nozzle Heads of wellANT

Nozzle Head Design – Step Head

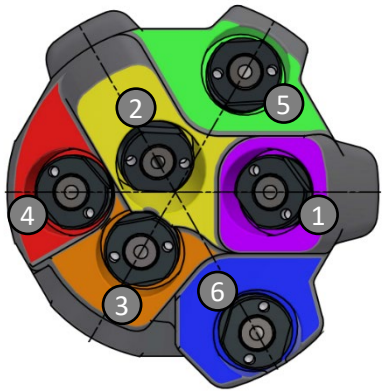
1) Calculated nozzle configuration



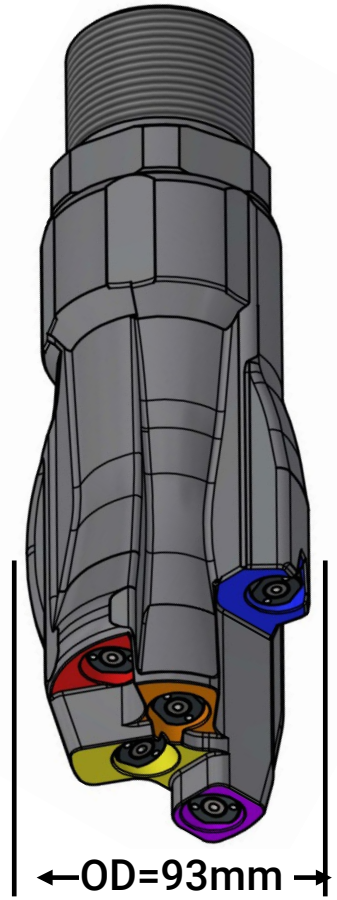
OD=120mm
Erosion OD

Constant Movement => with stroke

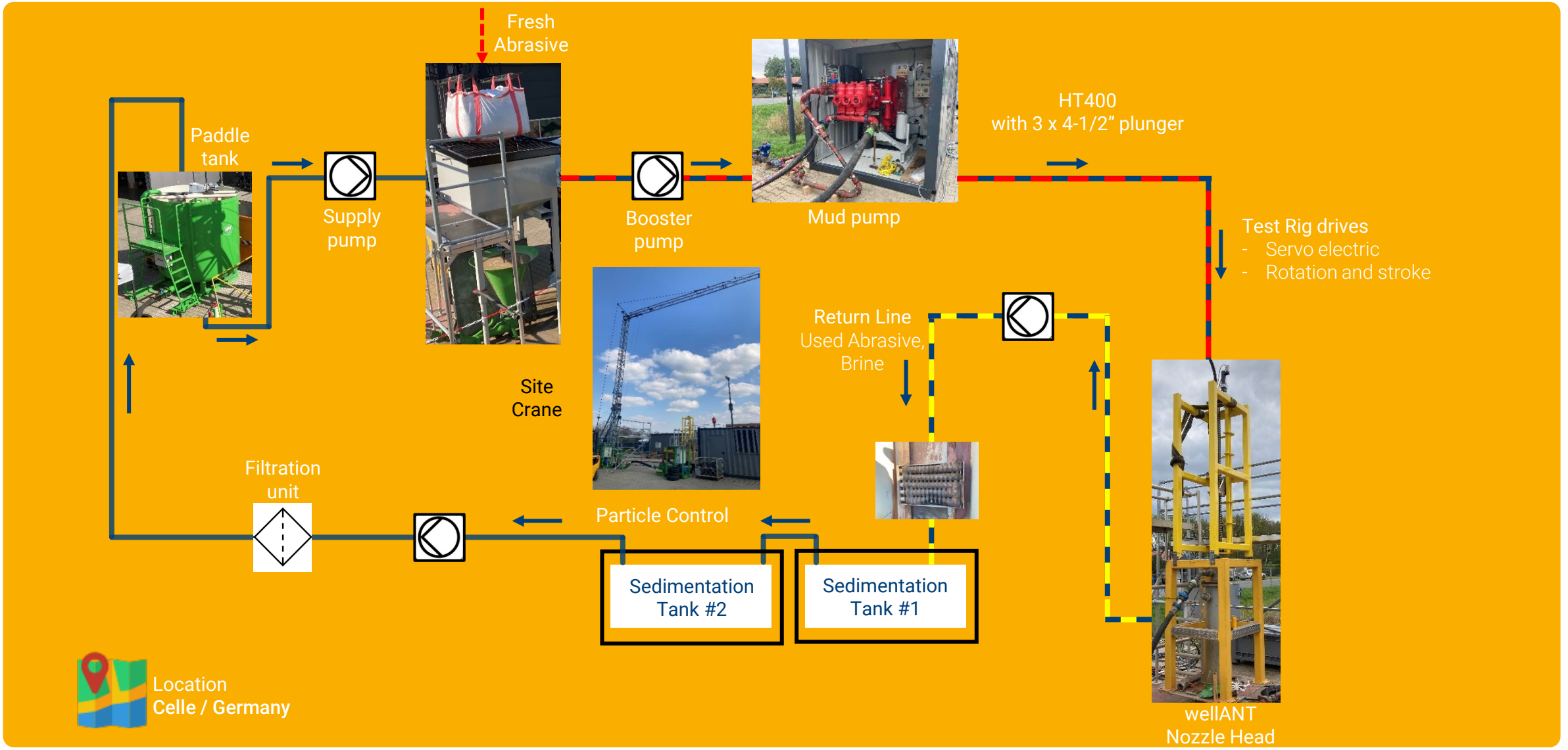
415 bar @ 412 lpm
(6400 psi @ 108 gpm)



Step Head	Ø
Nozzle 1 (magenta)	2,5
Nozzle 2 (yellow)	2,5
Nozzle 3 (orange)	2,5
Nozzle 4 (red)	2,5
Nozzle 5 (green)	2,5
Nozzle 6 (blue)	2,5



Onshore test set up of wellANT
Test-Rig Setup



Examples and Applications - wellANT

Stuck flow target coil tubing

12 min | 4“ hole

Cement Removal

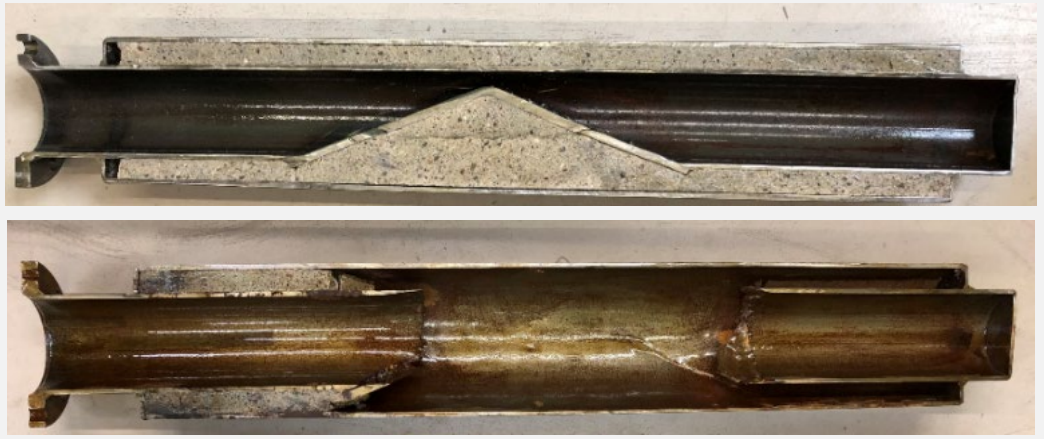
10 min | 750mm Travel

Flapper valve Inconel

15 min | 4,2” hole

Angled Flow target test

15 min | 4,9“ hole



Collapsed wells

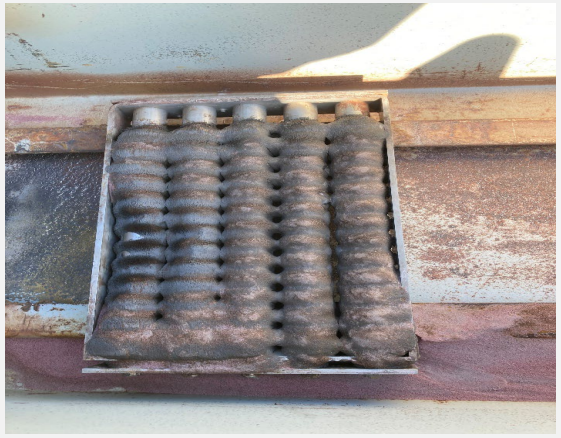
70 min | 4” tubing

Examples and Applications - wellANT

4.5” Tubing test fixture with collapse

4.5” Tubing test fixture cut in half

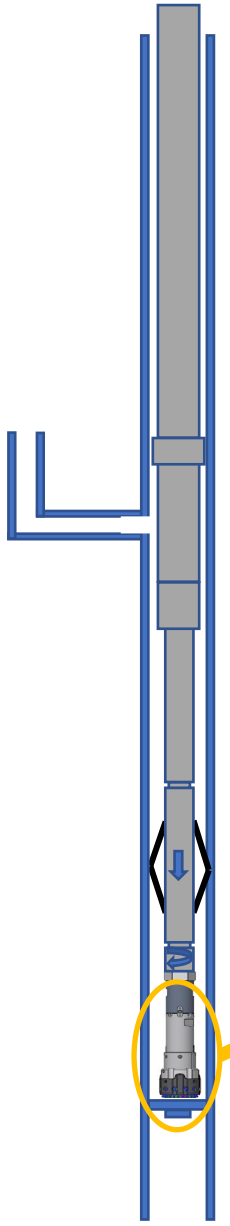
Cement returns



Magnetic returns

wellANT topside equipment wear info

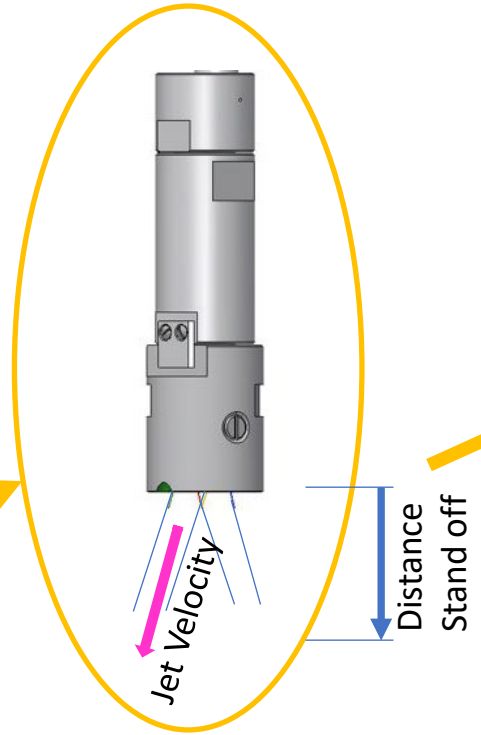
General Information

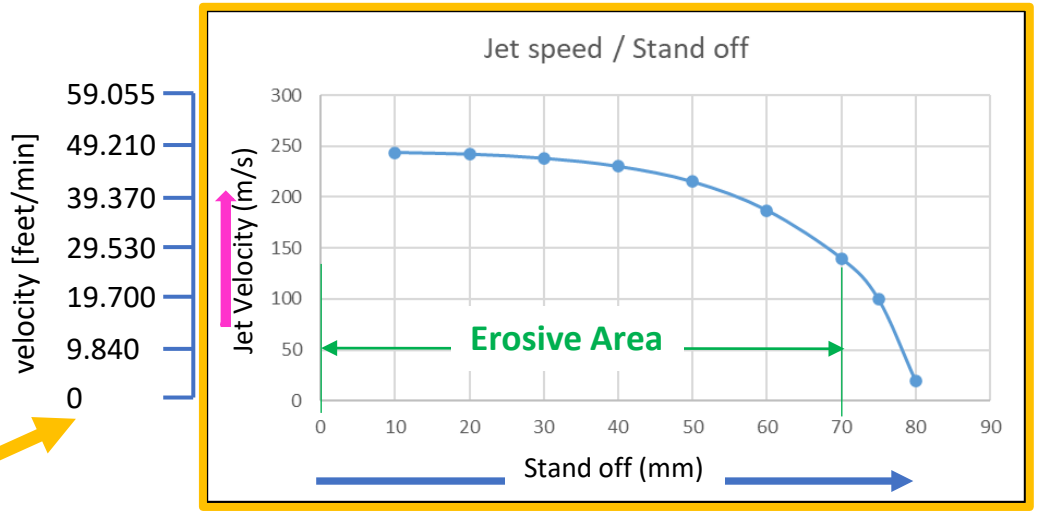


wellANT parameter - Topside

Max Flow rate:	125 gpm (480 l/min)
Max Working pressure:	6100 PSI (420 bar)
Max:	6 nozzles
Max Sand rate:	110 lbs/min (50 kg/min)

Q: Jet velocity in water – Toolside ?





Statement: wellANT jet under water is only erosive to max 70mm distance => **Erosive Area** is between 250 m/s to 150 m/s

Statement: wellANT Jet velocity under water started with max 250 m/s after exit and is reduced to 10 m/s after 80mm

Components and Record => Pump

wellANT parameter - Topside

Max Flow rate:	125 gpm (480 l/min)
Max Working pressure:	6100 PSI (420 bar)
Max:	6 nozzles
Max Sand rate:	110 lbs/min (50 kg/min)

Pump:
Mud
and
Sand

ANT uses mainly 2 kind of pumps:

1. MSI TIH – 600
2. Halliburton HT 400

Statement: max usage of wellANT in one “Go” with same pump was max 20 hours (60 tons of sand) WITHOUT any identifiable wear

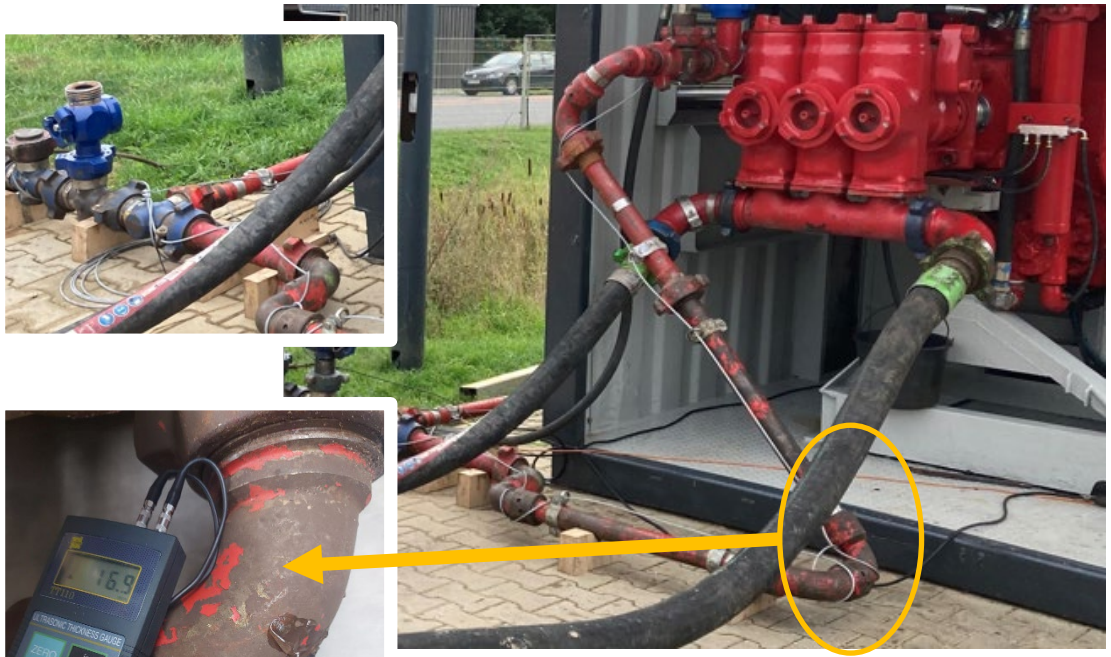
Components and Record => circuit components

wellANT parameter - Topside

Max Flow rate:	125 gpm (480 l/min)
Max Working pressure:	6100 PSI (420 bar)
Max:	6 nozzles
Max Sand rate:	110 lbs/min (50 kg/min)

Circuit:
Mud, Sand, Removal

ANT uses standard:
- Chicksan 1502 at 2”
- Hydraulic Hose 420 bar (6.200 psi)
  - Size $1^1/_2$” (Info: 7 m/s)
  - Size 2 “ (Info: 4 m/s)



Check for wear by measering the wallthickness in situ

Statement: Circa 100hrs (300 tons of sand) during wellANT operations WITHOUT any identifiable wear in the pressure lines

Outlook of wellANT

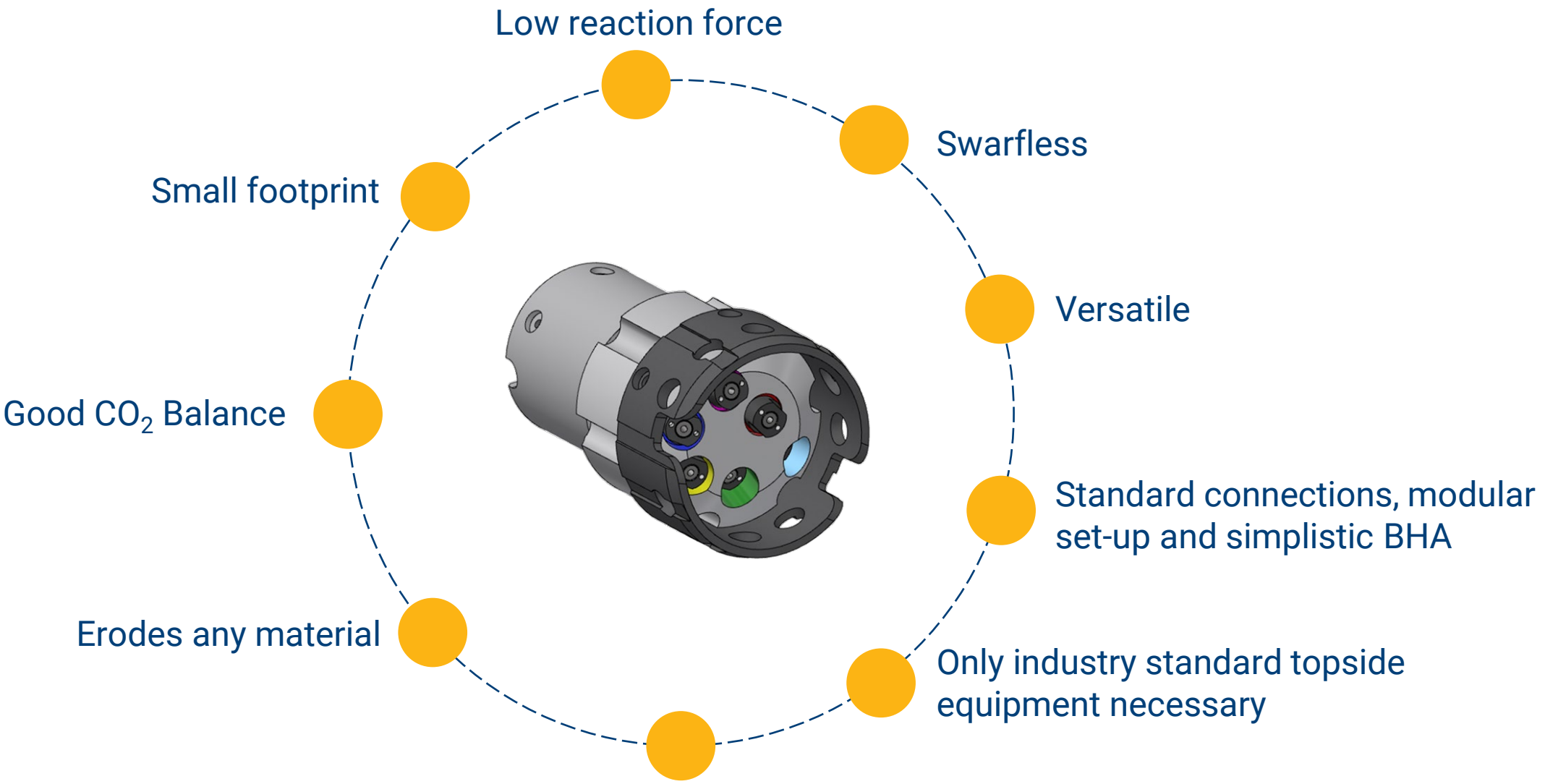
Whats next for wellANT?

- **Section Eroding** (in development)
- **Side Tracking** (in development)


wellANT

wellANT Video

Advantages of wellANT




Q&A