

## When Failsafe has to Mean FAILSAFE

### Tunnel Boring Machine Robotic Arm Utilizes Backup Tooth Brake

A custom SEPAC Spring Engaged Tooth Brake (SETB) is used by OC Robotics as the backup fail safe brake on their robotic arm mechanical drive system. This new generation OC Robotics JetSnake is being used to clean and inspect the rotary cutting blades on a record-size tunnel boring machine (TBM) operating at 50 m below sea level (see panel below).

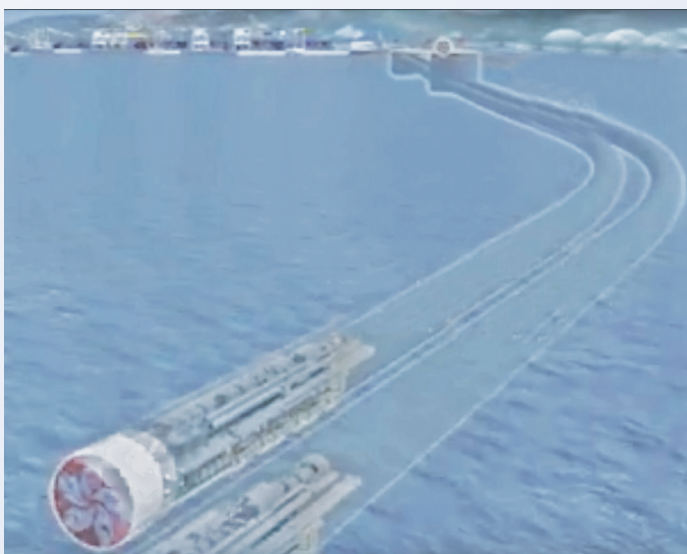
Special design considerations for the brake included extended life cycle, elevated ambient temperature, increased torque capacity, custom coil voltage, special installation features, metric threads, customer specified lead wire and length, and holes for sensor installation.

OC Robotics' new generation JetSnake v2 system design improvements include the SEPAC failsafe brake system, plus increased operational length at higher



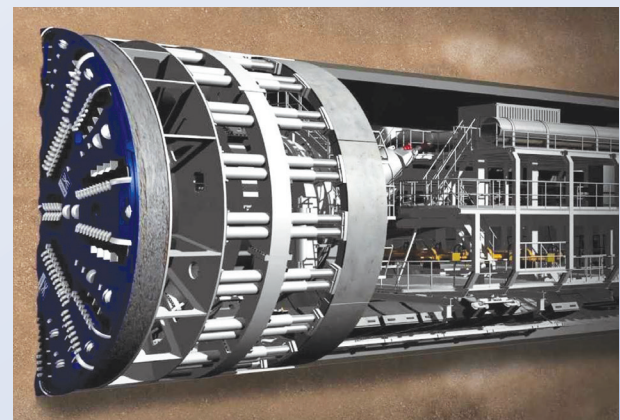
pressures (up to 5bar), and advanced integration with the tunnel boring machine for quicker installation and

maintenance. The JetSnake is adept at working in temperatures of up to 45° C (113° F) and 100% humidity.



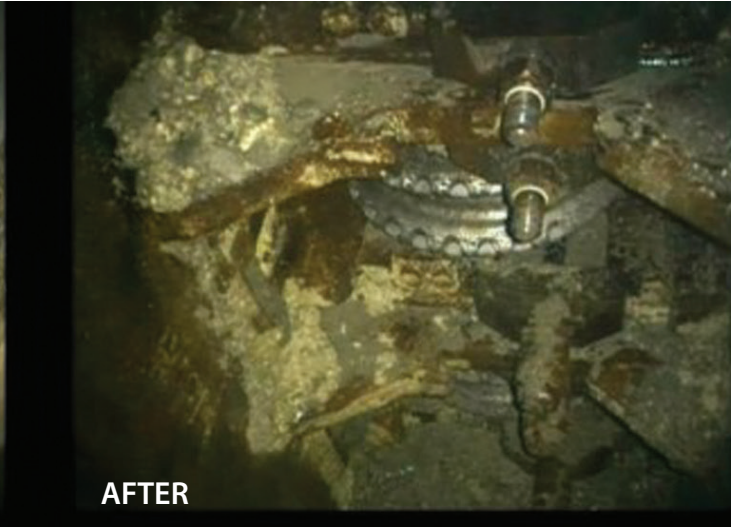
*Left: Two 5 km long sub-sea road tunnels are currently under construction between the mainland and Hong Kong International Airport. Excavations takes place at up to 50 m below sea level and under 5 bar of pressure using a world record size TBM.*

*Below: The TBM's front face diameter is 17.6 m (57.7 ft) covered with rotating cutting heads that turn 3.2 revolutions every minute. The TBM's length averages 150 m (492 ft).*



For more details on the tunnel project, go to: <http://www.ocrobotics.com/hong-kong-jetsnake-cleaning-and-inspection-of-tbms/>

# SEPAC® Application Report



The OC Robotics JetSnake arm is equipped with a high pressure water jet for cleaning and a camera and lights for real time process monitoring and inspection.

A new machine vision system has also been integrated to provide laser profilometry to measure disk wear on the TBM cutting heads.



The SEPAC spring engaged tooth brake provides a critical backup failsafe function to protect the integrity of this extremely important piece of machinery on one of today's most challenging engineering operations.

\*All photos courtesy of OC Robotics.



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