



YETIMOVE

WE ARE AUTONOMY

YETI AUTONOMY SERVICE PLATFORM
AIRPORT



AUTONOMY FOR AIRSIDE OPERATIONS

The need for more sustainable and efficient airside operations are becoming increasingly important. Autonomous and automated solutions is key to meet this demand. Yeti Move has developed an autonomy platform enabling self-driving and driver assisted snow removal operations. The solution reduces training needs for personnel, improve precision and quality, and gives a predictable timing for runway snow clearing. An online system gives an overview of ongoing operations, performance and equipment status. The Yeti Move autonomy platform is prepared as a common system for multiple operations airside such as grass cutting and rubber removal.

SUSTAINABILITY

Sustainable solutions

- ▶ Energy optimization, reduced fuel consumption and emissions
 - Efficient snow clearing with preplanned operations
 - Coordinated activities
 - No repetitive operations due to unsuffisioned snow clearing quality
- ▶ Reduced idle running
- ▶ Autonomy enables transition from fossil to clean energy
- ▶ Reduced wear and tear
- ▶ Improved lifetime of the machines

Reduced Cost

- ▶ Significant reduction of the number of operators
- ▶ Less administration
- ▶ Reduced maintenance costs



IMPROVED PERFORMANCE

Optimized training

- ▶ Efficient planning, training and simulation tools
- ▶ Less training with vehicles airside
- ▶ Efficient training on new equipment and tools
- ▶ Reduced repetition training
- ▶ Pre-briefing with simulation

Increased accuracy

- ▶ Improved overlap control
- ▶ Better control in low visibility conditions
- ▶ Controlled formation with safe distance between vehicles
- ▶ Operating modes adapted to weather conditions
- ▶ Equipment control for optimized performance
- ▶ Predictable timing for runway snow clearing

Reduced impact of human factors

- ▶ Improved performance related to human skills and experience
- ▶ Guidance and automation for machine and tool settings
- ▶ Consistent driving paths and formations
- ▶ Reduced fatigue during long operations
- ▶ Breaks and crew change eliminated in autonomous operations



IMPROVED SAFETY

Increased level of safety

- ▶ Collision avoidance
- ▶ Low visibility support for driver assist
- ▶ Snow and ice are always thrown in a safe direction
- ▶ Reduced damage on fixed infrastructure

STATUS OVERVIEW

Easy overview of the machine status

- ▶ Online machine status for all vehicles
- ▶ Easy overview of fuel status and other consumables
- ▶ Status of brushes with replacement warning
- ▶ Error codes and alarm messages

COMMON PLATFORM

One platform for multiple operations

- ▶ Snow clearing
- ▶ Chemical spraying / de-icing
- ▶ Rubber removal
- ▶ Grass cutting
- ▶ Foreign object debris (FOD) inspection
- ▶ Incursion
- ▶ Bird strike protection
- ▶ Painting
- ▶ Logistics at the airport (baggage, shuttle bus)

The functions can be executed one by one or simultaneous from the same platform and planning tool.





YETI MOVE is developing sustainable autonomous solutions for professional users. Yeti Move started with autonomous vehicles for snow removal at airports and are now in the process of establishing the solution in other areas such as port logistics, industry and construction. Yeti Move is based in Kongsberg's technology environment and is a small, but world-leading company within autonomous solutions. With the Swedavia frame agreement, signed December 2019, and the Avinor frame agreement in 2021, Yeti Move has a leading position within autonomous snow removal solutions at airports. The technology is OEM independent and can be used for several autonomous operations airside.

1 | YASP AIRPORT

Yeti Autonomy Service Platform for Airports

- ▶ Autonomous and automated airside operations
 - Snow Removal, Grass Mowing, Rubber Removal
- ▶ Operation Execution, monitoring and logging
- ▶ Incursion / Geofencing
- ▶ Fleet Management
- ▶ Adapted to rules for airport operation
- ▶ Documentation of Airport Maintenance

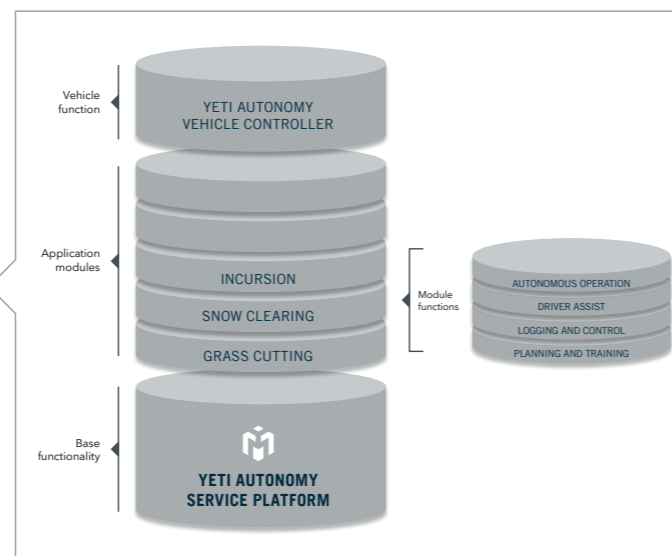
Snow removal operation:

- ▶ A collection of vehicles that perform a joint task of snow removal
- ▶ Mix of vehicle types; Sweepers, Snow Blowers and Sprayers
- ▶ Mix concurrent operational modus; Autonomous, Driver assist, Manually



2 | PLANNING AND TRAINING

- ▶ Digital plans for snow clearing operations
- ▶ Digital simulation of snow clearing operations
- ▶ Digital optimization of snow clearing operations
- ▶ Digital education, reduced physical training
- ▶ Documentation of winter maintenance plans



3 | DRIVER ASSIST

- ▶ Operator display with instruction for
 - Individual path guidance with offset indication
 - Speed reference
 - Turn notifications
- ▶ Equipment control
 - Change ploughing direction
 - Lift/lower plough and brush
 - Increase/Decrease blower power
- ▶ Optional automated equipment control based on vehicle position (plow, brush, blow)
- ▶ Safer low visibility operations
- ▶ Possible to use less trained personnel

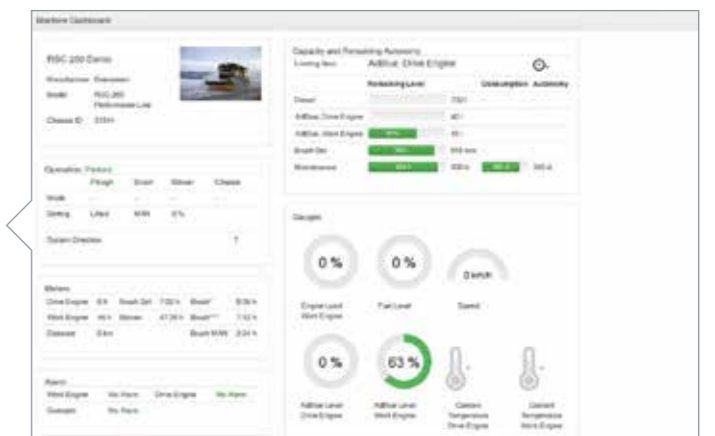


4 | AUTONOMY

- ▶ Full driverless functionality on all vehicles
- ▶ Navigation and formation driving with equipment control according to planned mission
- ▶ Operation and supervision from command vehicle
 - Hold at stop points
 - Pause and start
 - Speed adjustment
 - Path selection alternative routes
 - Adjust equipment settings

5 | FLEET CLOUD

- ▶ Stand alone installation or as part of YASP
- ▶ Logging of snow removal operations with detailed information
 - Vehicle and equipment status
 - Driving pattern
 - Fuel consumption etc.
- ▶ Automated reports
- ▶ Possible to compare actual with planned operation in connection with Planning & Training module
 - Continuous improvement
 - Pre- and post briefing of operation
- ▶ Data export/import





SYSTEM OVERVIEW

| USER INTERFACE

- ▶ GUI for planning and training
- ▶ Control and execution interface for operations

| YASP AIRPORT

- ▶ Cloud based application
- ▶ Coordination of all operations
- ▶ Interface to all vehicles

| COMMUNICATION

- ▶ 4G / 5G communication
- ▶ Cyber security
- ▶ Optional radio-based communication

| VEHICLE CONTROLLER / HARDWARE

- ▶ Vehicle self-driving control
- ▶ Snow clearing equipment control
- ▶ Navigation and communication
- ▶ Driver Assist interface

| GNSS SATELLITE

Satellite receiver supporting GPS, Glonass, Galileo and BeiDou systems

| RTK CORRECTION

- ▶ Correction of GNSS position to centimeter level
- ▶ Distributed over communication interface

| SAFETY / EMERGENCY STOP

- ▶ Dedicated radio system for safety/emergency stop

- ▶ Can be initiated from any of the vehicles, command vehicle and tower
- ▶ Independent from fleet controller and vehicle controller

| COMMAND VEHICLE

- ▶ Interface to YASP Airport
- ▶ User interface with online supervision and control
- ▶ Emergency stop

| CONTROL TOWER

- ▶ Interface to command vehicle (radio)
- ▶ Emergency stop

| FLEET CLOUD

- ▶ Web browser interface to vehicle logs and status
- ▶ Automated reports



www.yetimove.com
info@yetimove.com