LOTTRACK

SMART AUTOMATION FOR SEMICONDUCTOR FABS

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INVEST IN MOVEMENT, NOT STORAGE
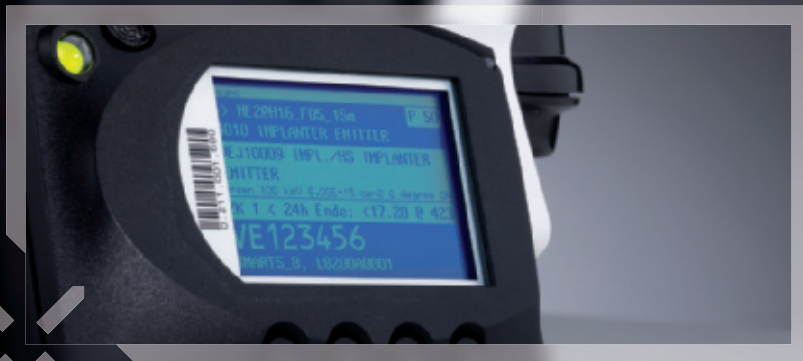
SMART AUTOMATION

Manually operated semiconductor fabs with a broad range of products and technologies are increasingly faced with on-site logistical challenges. Demanding performance objectives such as zero-defect, on-time delivery or reduced cycle time need to be achieved, while cost pressure is still high. The common approach to improve manual fab logistics is to implement "Hard Automation" technologies, such as conveyer systems or stockers. These technologies require high investments, decrease flexibility and do not improve the overall fab situation.

To cope with these challenges, Intellion realized the LotTrack system based on a "Smart Automation" approach to control the logistic flow. The key is to radically rethink the role of the operator in the fab: Following the Smart Automation approach, the operator becomes the center of the information processing world. Instead of seeing the operator as a lot searcher, system user or information collector, LotTrack

empowers him to be an effective contributor to the overall production flow, avoiding all useless activities.

LotTrack supports the operator by assisting and tracking all operator actions in real time right at the point of action: at the "smart" wafer-carrier. LotTrack uses wireless technologies in order to make each single wafer-carrier a smart mobile device that is able to deliver and collect information in real time. As a result, all operator actions will be compliant to global control objectives and rules. All local shop floor activities will be sensed and sent to the fab control system (MES, dispatcher) as a basis for increased logistic capability.

Smart Automation significantly improves in parallel the capability of production logistics, operator handling efficiency and enhances operational flexibility in manually operated semiconductor fabs.

SOLUTION LOTTRACK

LotTrack is an operator focused wireless infrastructure to thoroughly track and assist manual logistics and handling operations inside a wafer fab. Working like an "indoor GPS", the system delivers the position of each wafer-carrier in real time and assists the operator according to the next operation and destination information. LotTrack offers global tracking and control functions based on two major functionalities:

- High precision real time localization (< 0.5m) of wafer-carriers in bays

- Energy efficient, high resolution user interfaces (display, markers, signalers) on each wafer-carrier.

LotTrack is the most efficient system to achieve "line control" for manually operated fabs. The solution has received several awards and is unmatched in the semiconductor industry.
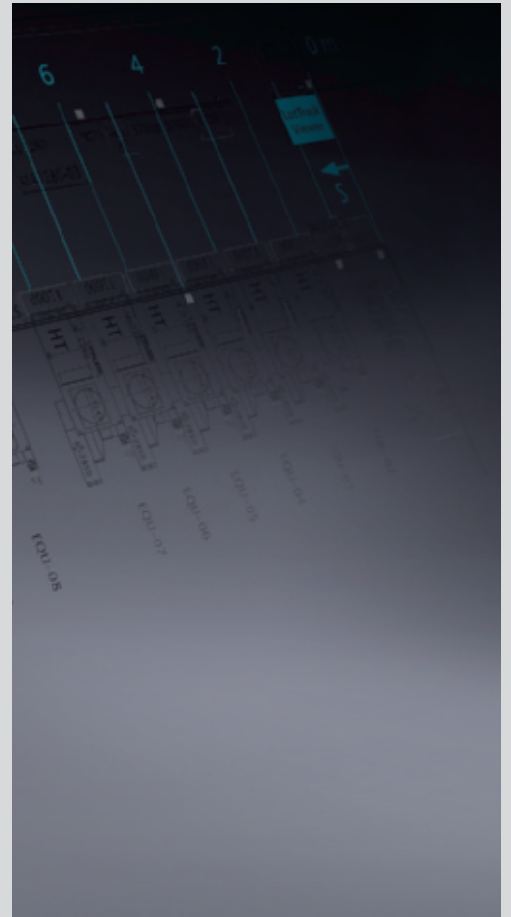
BENEFITS

Reduced Cycle Time and WIP
Full shop floor visibility provides a platform for logistic optimization leading to shorter cycle times and lower WIP. Dispatch lists can now easily be followed by operators, because every lot can be found immediately. As a result, compliance to dispatch priorities is achieved.

Increased Operator Efficiency
Increased operator efficiency is achieved by avoiding lot searching activities due to exact lot positions in the fab at any time. Furthermore, all relevant and correct information (such as next destination, lot priority) is available at the point of action, reducing operator efforts to gather information from different IT systems.

Paperless Fab
LotTrack is the shop floor enabling part of paperless manufacturing. Paper based run cards are substituted by the DisTag's large display. Using this display, the operator is assisted at any time: operation and transport information (e.g. lot number and states, next scheduled operation, next destination) are available at each individual lot in real time, regardless of the actual lot location.

REFERENCES

LotTrack has been implemented and is being operated by Intellion in three major European and Asian fabs of Infineon Technologies AG. LotTrack has proven highest reliability in a 24/7 environment over several years of operation.

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SMART LOGISTICS DELIVERED

SOLUTION ARCHITECTURE

SYSTEM COMPONENTS

LotTrack enables a Smart Automation environment for localization, communication and operator assistance. The system architecture is based on three main components:

- LotTrack Control Suite: the software that operates the LotTrack solution and integrates all relevant information systems in the fab, such as MES and Dispatcher.

- LotTrack Antenna Lines: an industry proven, patented wireless infrastructure that enables communication and localization functionality in all fab areas without any physical process restrictions.

- DisTag: The smart device, placed on each wafer-carrier, allowing localization of wafer-carriers all over the fab and communication with the operator at the point of action.

The LotTrack architecture is the basis for real time logistic control while keeping operational flexibility in manually operated fabs.

PERFORMANCE FIGURES

High Reliability
LotTrack has proven highest reliability in a 24/7 environment over years of operation. Our Swiss engineering team combined cutting-edge technologies with profound semi-conductor process know-how in order to achieve this "design in"-reliability. LotTrack tolerates alterations of the shop floor and does not require a continuous line of sight between the DisTag and the Antenna Lines (localization and communication infrastructure).

Easy to integrate and operate
LotTrack consists of different modules that are easy to implement and integrate. Software interfaces (API) to superior IT-systems (particularly the MES) are available. In order to reduce implementation activities for the LotTrack Antenna Lines within the fab to a minimum, a modular mounting system is used for installation to the fab's ceiling. This mounting system integrates all required controllers, antennas and sensors, making installation of additional cables almost unnecessary.

LOTTRACK

LOTTRACK CONTROL SUITE

MES

ETHERNET

LOTTRACK ANTENNA LINE

DISTAG

LOCATE

ASSIST
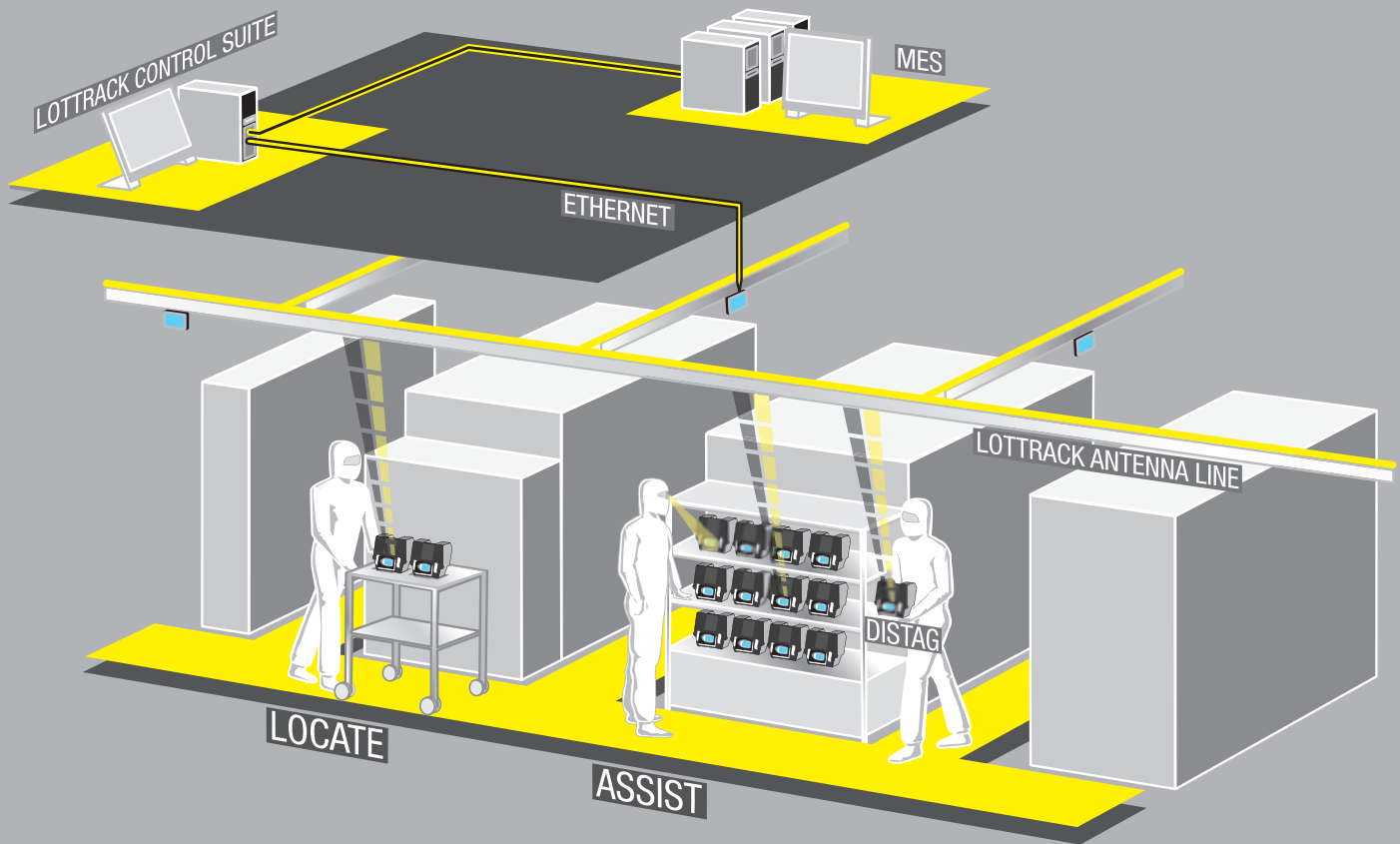
CORE FUNCTIONS

Locate
LotTrack allows the locating of all wafer-carriers in real time all over the fab. On the shop floor level, this enables operators to locate and find each individual lot at any time. On the control level, an overall visibility of all lots in the fab is provided as the basis for material flow control and operator assistance.

Assist
In order to increase the logistical performance of the fab, lot location is the basis, but not enough. Appropriate operator assistance at any time right at the point of action – the individual lot – is key to really controlling the material flow. This is done using the DisTag's display and signaling devices. Fully integrated in the fab's MES and dispatcher, LotTrack can deliver all relevant information in real time to each individual lot.

Robust localization and active assistance is key to benefiting from an operator centered automation approach.

SYSTEM COMPONENTS

- LotTrack Control Suite
- LotTrack Antenna Line
- Dis Tag

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PRODUCT COMPONENTS

DISTAG

The DisTag is the smart man-machine interface placed on each wafer-carrier, allowing it to be located with an accuracy of < 0.5 meter. A large energy efficient, high resolution display allows communication with the transport operators. Signaling devices (e.g. LED, Flipdot) provide priority and search functions. Using the DisTag's control panel, an interactive dialogue can be carried out by the operator. The DisTag's battery lasts about two years with normal use and can be replaced easily.

LOTTRACK CONTROL SUITE

At the core of the LotTrack System is the LotTrack Control Suite, composed of three integrated software applications. The LotTack Server links all shop floor activities to the MES, the dispatcher or other IT clients. The LotTrack FabViewer provides full visibility of all transport and storage activities. The LotTrack Monitor serves as a tool for advanced diagnostics and surveillance of all system components and conditions. Overall, highest availability, failover and DB caching as well as exception handling mechanisms are delivered by the LotTrack Control Suite.

LOTTRACK ANTENNA LINE

LotTrack Antenna Lines are the wireless localization and communication infrastructure mounted to the clean room ceiling along the inter- and intrabays of the fab. Thanks to the modular mounting system they can easily be adapted to every fab layout, reducing implementation time to a minimum. This mounting system integrates all required controller modules, antennas and sensors, making installation of additional cables almost unnecessary.
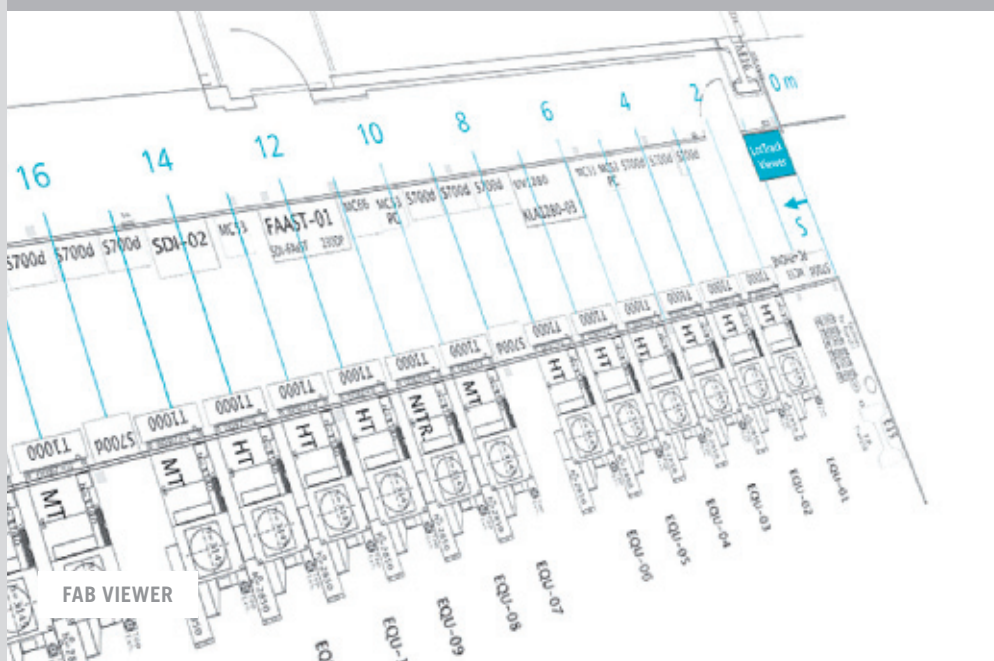
DISTAG

FLIPDOT

LED

FAB VIEWER

INTERFACES

Interfaces (API) for easy integration into the fab's Manufacturing Execution System (MES) are provided by the LotTrack Control Suite. The API provides all functions to interact with the DisTags.

Adapters for mounting the DisTag onto the wafer-carriers are also provided.

ANTENNA LINE

CONTROLLER MODULE

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ABOUT INTELLION

Intellion provides innovative system solutions that support and monitor manual processes of production logistics. By using these solutions our clients increase their operative productivity without having high investment costs for fixed automation solutions. In the focus of our solutions are mobile means of transport and production, which we turn into "Smart Things" using sensor, display and wireless technologies. With this we establish visibility for process control and support the work of the operative staff.

As general contractor, and in close collaboration with our clients, we conceptualize and develop individual solutions for the monitoring and assistance of manual processes in production logistics. Based on identified productivity potentials, RFID, sensor and localization as well as display and communication technologies are combined to an effective tracking and assistance solution.

The basis of our success is our integrated engineering approach at the interface between application and technology. An experienced team integrates process, software and hardware know-how to robust solutions. Partnerships with leading research institutes (University of St. Gallen, M-Lab, ETH Zurich, MIT, RWTH Aachen) guarantee our access to latest developments in business and technology.

Intellion was founded in 2000 as a spin-off of the University of St. Gallen (HSG) in Switzerland and has continually evolved into the innovation leader for wireless based turn key solutions.

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