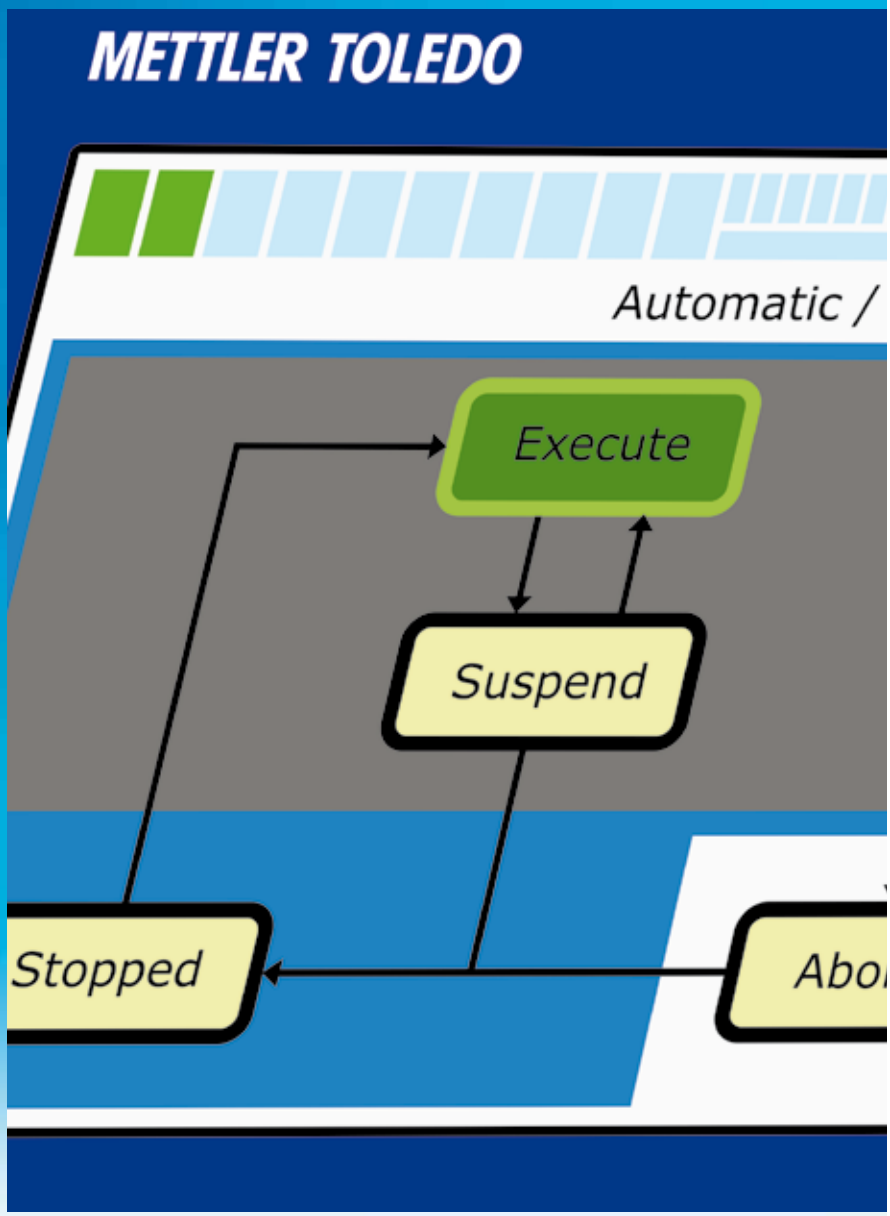
Connectivity



Product Inspection, OMAC and PackML™

OMAC and PackML™

Industry Standards for OEE Improvement

METTLER TOLEDO

What is OMAC?
Understanding PackML™ and OEE

METTLER TOLEDO is a member of the Organization for Machine Automation and Control (OMAC) and has been an active participant in OMAC activities for several years. METTLER TOLEDO is the largest global producer of product inspection equipment. This position with our participation in OMAC provides us with an active listening channel, and the opportunity to lend our expertise to our OMAC partners in developing standards for critical communications and other key areas of machine automation.

Who is OMAC?

OMAC was founded in 1994 and is made up of end-users, technology suppliers, and machine builders, such as ourselves. OMAC members are recognized as industry leaders within the End Users and Equipment Manufacturers group.

Technology providers are the largest segment and include Rockwell Automation, Siemens, B&R, Beckhoff, General Electric, Mitsubishi, Lenze, Schneider – to name a few. There are also non-profit standards and government organizations as members. Learn more about OMAC and the industry leaders who are members at **www.omac.org**.

The OPW part of OMAC

OMAC's charter is broad, covering all types of machinery and related automation. A group of major influence within OMAC is the OMAC Packaging Workgroup (OPW). This group focuses on issues related to the packaging industry, and develops tools and standards that support this large industry. Without question, the most prominent outcome from the OPW is the development and implementation of PackML, a Packaging Machine Language.

METTLER TOLEDO's involvement with OMAC and PackML (ISA TR88.00.02)

Starting in 2002, OMAC began work to develop a machine language that would communicate consistently between all forms of packaging equipment and line controls. The intent was to make every packaging machine report its operational status the same way, independent of the machine type. As an analogy, PackML is for packaging equipment what Morse code was for the telegraph. In 2005, METTLER TOLEDO began work on a new control platform for its checkweighing products, and had been looking for a method that was industry-accepted, and internationally viable. The membership of OMAC – large, international users and suppliers – was precisely what METTLER TOLEDO was seeking.

OMAC is not just about PackML. The organization is driven to define standards that are mutually beneficial to both users and suppliers of packaging equipment. One example is a standard for equipment status lights. If you ask ten users for their status light requirements, you will be lucky to get nine different answers. The identification of machine status through status lights should be as consistent as the colors on a traffic light. OMAC is also pursuing an industry-standard calculation of OEE (Overall Equipment Effectiveness), to make the determination more consistent. METTLER TOLEDO is an active member of OMAC, and participates in the PackML Standard, PackSafety™, and PackSpec™ committees.

PackML and METTLER TOLEDO
Across the Product Inspection Portfolio

The PackML progression began with checkweighing, but the advantages of PackML were obvious and the method migrated to other inspection forms in our Product Inspection Division. PackML is now the standard for all machine-state communications across product inspection equipment produced by METTLER TOLEDO.

The first implementation was through fieldbus interfaces, with Ethernet IP and Profibus as the most commonly sought. As OPC became a more popular solution for communication with SCADA systems, it was logical to apply PackML in those tools. METTLER TOLEDO then launched "ProdX", a software tool that collects data from our product inspection equipment. ProdX also provides statistical reports, archiving capabilities, the ability to communicate bi-directionally with a user's host computer, and manage the equipment from a remote location. Again, PackML is the machine-state backbone for that product. METTLER TOLEDO is "invested".

Metal Detectors

Detect metal or materials with high conductivity. PackML reports metal contamination events that affect the line effectiveness.

Checkweighers

Measure weights of individual packages to assure content compliance. PackML provides throughput information, along with machine status.

X-ray Inspection Systems

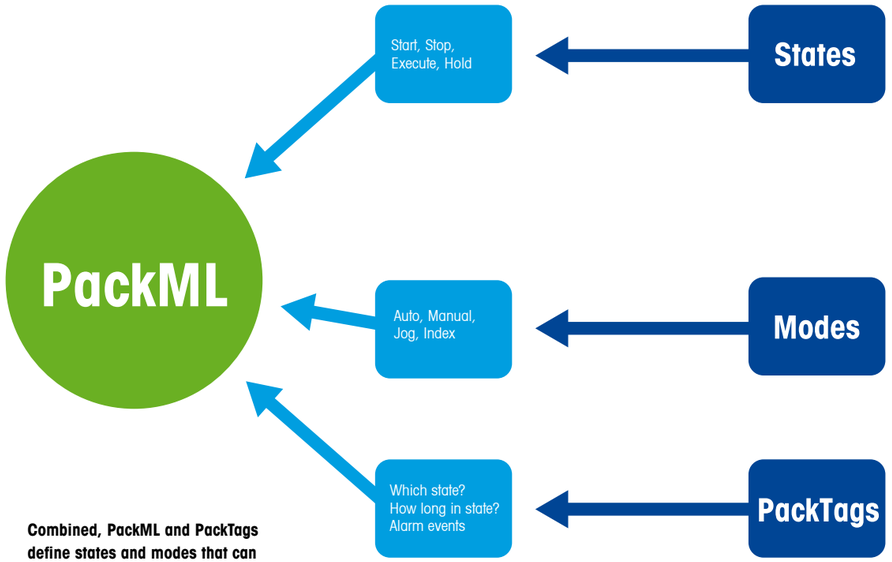
Detect contaminant materials of high density. PackML delivers package rates and contaminant events, that aid in process improvement.

Benefits of OMAC

What Value Does PackML Deliver?

How is PackML structured?

PackML uses three categories of information; States, Modes, and PackTags. These are the "dots and dashes" - referring to the earlier Morse code analogy. States are the most fundamental conditions seen in a production line. They give the line-control PLC and other equipment in the line knowledge of the condition of our equipment. Modes are common forms of operational activity. PackTags provide the accounting tools needed to perform calculations for efficiency, that are critical to line improvements.



Combined, PackML and PackTags define states and modes that can be used to develop common function blocks for machine-to-machine integration.

States

States identify the operational condition of the machine. The agreed states in PackML are stopping, stopped, aborting, aborted, starting, executing, suspending, suspended, unsuspending, holding, held, unholding, clearing, completing, complete. Each state has a specific, defined use that is given in the ISA TR88.00.02 standard. Not all machine types will have use for all of the defined states. The specific implementation for a type of machine should list only the applicable states, to focus on the information of value. Based on the form of the words used (e.g., stopping, stopped), the precise condition of the machine as either a transitional state, or a steady state is apparent to the user.

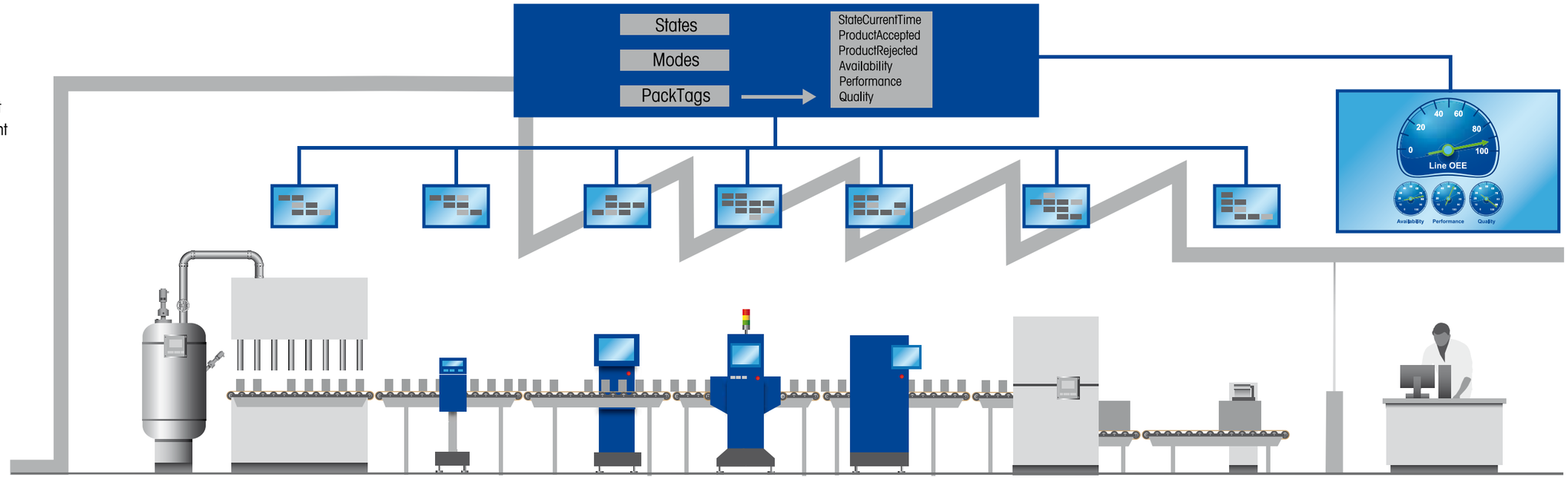
Modes

Modes identify "how" a machine is operating. They are used to further define the state. Common modes are automatic, semi-automatic, manual, index, jog, clean, etc. Again, the application of PackML should not be burdened with modes that are not relevant to the operation. In product inspection, for example, there is generally no reason for a "jog" mode.

PackTags

PackTags identify operational characteristics of the machine and the duration of individual states. Examples for product inspection include speed in packages per minute, number of rejected packages, and time spent in the different states.

PackML data is available on a machine by machine basis, but when combined can offer insight into the production line OEE



Benefits of PackML
What Value Does It Deliver?

PackML is a valuable tool in the continuous improvement environment we all experience today. Intelligent users will apply PackML outputs to constantly monitor the process, collect and analyze data, and adjust the operation. This will lead to a higher performing process.

The image to the right depicts a typical cycle that drives higher OEE over time.


PackML
HI-SPEED
X-Series
PackML™ Version 3.0

Application Note 81A - PackML

The benefits of PackML are described below in an excerpt from another METTLER TOLEDO publication on the topic.

The PackML state model approach not only simplifies machine-to-machine integration but enables communication of relevant data from production to the office. PackTags, part of the ISA-TR88 release, are named data elements used for open architecture interoperable data exchange in packaging machinery from the "shop-floor to the top-floor". This interoperability between packaging machinery and upper level systems offered by the PackML state model provides an easy way to integrate a packaging line and deliver OEE data from individual machines into business information systems.

The data can be quite granular, rendering the production process highly transparent, which is why end users are increasingly interested in it. PackML builds off a proven industry standard and the end user benefits include:

- A consistent look and feel for the operator and technician
- A foundation for vertical and horizontal integration
- Standard information in/out of any PackML v3.0 capable packaging machine
- Packing line plug-and-play functionality
- More consistent end user specifications
- Faster software development time
- Reduced debug time through more robust and modular software programming
- Ultimately, efficiency in reusable hardware and software components and machines that cost less to build, use, and maintain

PackML and OEE
Data and Calculations

PackML development focuses on measuring production line OEE and identifies a number of standard machine states that contribute to the OEE measurement. This machine data is combined with data from other equipment on the production line to yield the overall line OEE.

Overall Equipment Effectiveness (OEE)

Overall Equipment Effectiveness (OEE) is a recognized industry standard method for measuring and quantifying the performance of production line equipment. The ratio of actual output divided by maximum capable output:

$$\frac{\textbf{Actual Good Output}}{\textbf{Maximum Capable Output}} = \textbf{OEE \%}$$

Three primary factors – Availability, Performance and Quality – are considered.

- **% Availability** – actual uptime / planned uptime
- **% Performance** – actual throughput / planned throughput
- **% Quality** – actual good product / total product produced

Every piece of equipment on a production line can and does impact the overall OEE percentage, including product inspection equipment. The table below gives examples of how the day to day use of product inspection devices can impact a production line OEE calculation.

Product Inspection (PI) Impact on OEE	Impact on Availability	Impact on Performance	Impact on Quality
Packages Rejected Due to Contamination			■
Packages Rejected for Specification Violation			■
Successive Package Faults	■	■	■
PI Device Stopped for Product Change Over	■	■	
Production Time and Product Loss Due to PVR* Testing	■	■	
False Rejects Due to Improper Settings			■
Production Line Stop Due to PI Device Failure or Fault	■	■	

*** PVR, Performance Validation Routine, is a software feature in our Metal Detector and X-ray machines where the user can set up a time interval to alarm an operator when it is time to run a validation test.**

OMAC and METTLER TOLEDO

The Organization for Machine Automation and Control (OMAC) consists of end-users, technology suppliers, and machine builders. OMAC members are recognized as industry leaders and include both End Users and Equipment Manufacturers. Notable members include Nestle, MillerCoors, Pepsico, Procter & Gamble, Rockwell Automation, Siemens, General Electric, Mitsubishi, Schneider – to name a few. There are also non-profit standards and government organizations as members. Learn more about OMAC and the industry leaders who are members at **www.omac.org**.

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