EBOOK

Moving people, safely and reliably

Best practice guide

Content

01 Summary

02 Seeing the unseen

03 Evaluating the right approach

04 Understanding the Maintenance Maturity Model

05 Getting there

06 Relying on the roadmap

07 Embracing a modern asset and work management solution

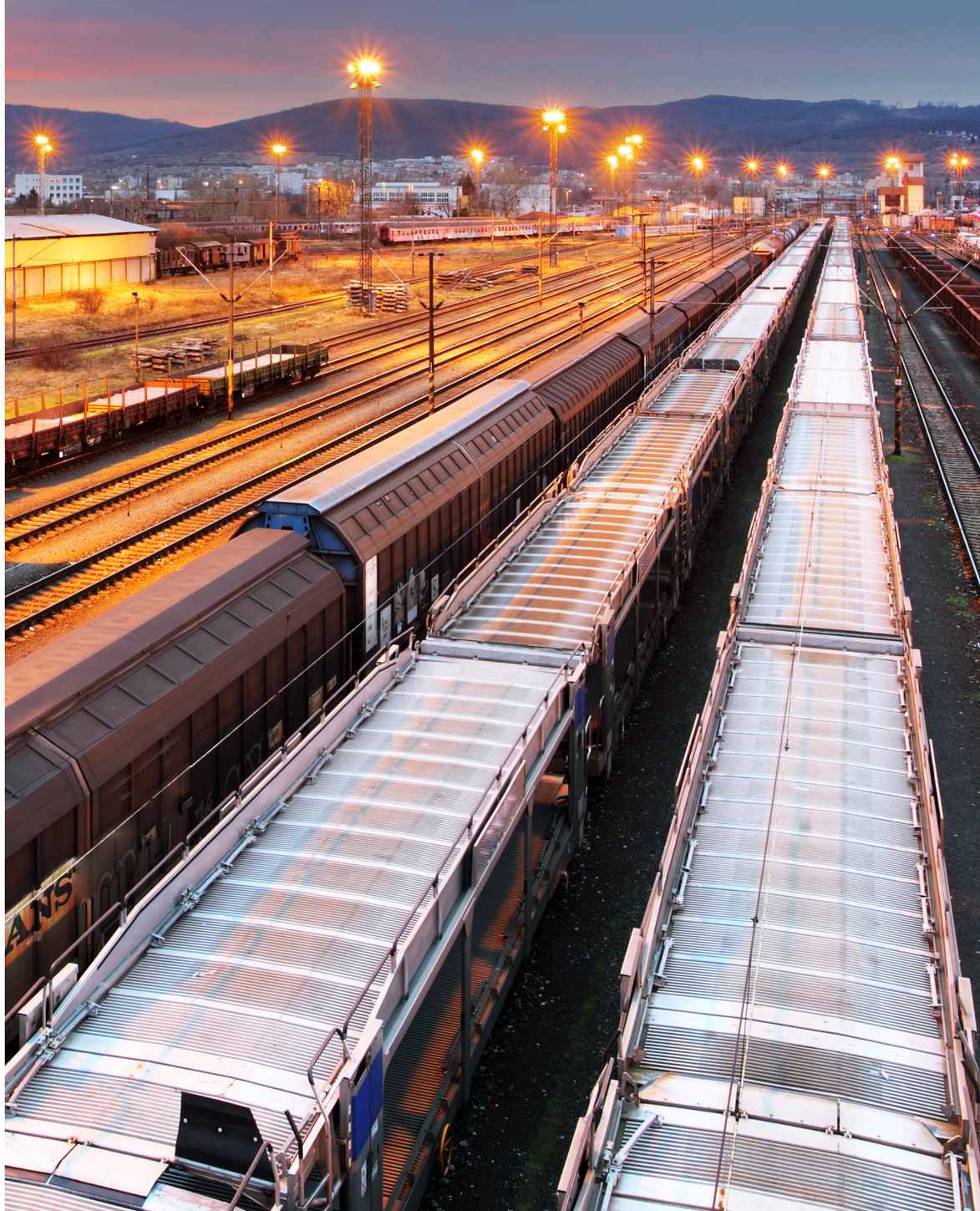
08 Finding the right partner

09 Dig into the data

01 Summary

While asset and work management involve rigorous practices across all industries, they have never been more critical to transit and transportation. The ongoing need to do more with less, along with emerging challenges around health and safety protocols, have created unprecedented demands for agencies around the world.

Asset management has always been important for sustaining transportation and keeping service up and running. However, with heightened public and regulatory attention around what it means to safely and reliably move people, that's not enough. This best practice guide outlines ways to rethink applied enterprise asset management (EAM) methods and practices to meet a new level of standards and expectations.



02 Seeing the unseen

Real-time demands on equipment, reliable material availability, safe and clean operational environments and the balance of optimized internal and external work forces are unrelenting for transit organizations.

At the same time, the visibility of an always-on (and sometimes off) service often means focusing solely on the rail cars, buses, other vehicles and linear assets when discussing crucial transportation assets. However, everything from underground drains to pressurized gas lines, to signs, signals and switches is equally important in keeping a system running.

Going further, simply running on time is not enough of a metric to show how assets are maintained. When a train platform, depot or station is rendered inaccessible or, even worse, deemed unsafe due to a broken escalator or elevator, then branding, reputation and revenue are immediately impacted.

Finding fluctuations

Amidst an evolving and changing industry, transit funding remains a challenge across the world. Asset management and service continuity are factors in that funding, no matter where it comes from. As an example, in the United States, the State of Good Repair standards follow Transit Asset Management (TAM) practices—a business model that prioritizes funding based on the condition of transit assets to achieve or maintain transit networks.

Implementing a TAM system requires collecting and using asset condition data, setting targets and developing strategies to meet goals. The State of Good Repair is a U.S. government mandate, but each country in Europe has its own methods for funding grants, often with their own maintenance standards and complexities.

03 Evaluating the right approach

Top concerns for any agency should be working to attain not only an understanding of the types of maintenance required but also recognition of all assets used by riders every day.

That means making sure that the right type of maintenance is deployed:

- For the right asset
- At the right time
- By the right person
- At the right place/point
- For the right condition
- Aligned to asset lifecycle cost

Mandatory in this approach is evaluating all maintenance methodologies, and how and why to move specific assets up or around the range of modes found in the Maintenance Maturity Model: reactive, preventive, condition-based, predictive and prescriptive practices.

Given the advancement of maintenance tactics like asset investment planning (AIP), asset performance management (APM), and digital work, enabled by applied technologies like artificial intelligence, machine learning and digital operational twin, transportation professionals now have the capability to create the most economic prescriptive maintenance asset management strategy.

04 Understanding the Maintenance Maturity Model

The Maintenance Maturity Model includes five levels:

- **Reactive**
  This means repairing the asset after it breaks or malfunctions. Prior to technology innovation, it was (and still is) a common practice in transit. This is the difference between fixing a blown-out tire versus predicting tire failure based on variables such as tire pressure, distance driven, age, condition and tread depth.

- **Preventive**
  Attempts to prevent failure by maintaining vehicles and equipment at pre-scheduled time intervals are the next step in maintenance maturity. This involves such practices as incorporating an OEM's preventive schedule into the care of a bus, rail car or supporting infrastructure. It also is important for warranty claims, which depend on proper documentation of preventive maintenance. While better than a reactive approach, preventive maintenance by itself, can still be inefficient, costly and involve unnecessary downtime.

- **Condition-based**
  This stage provides alerts around a single point of failure, based on gathered data from such systems as on-board telematics systems. However, this does not reflect the health of assets as a whole.

- **Predictive**
  Predicting asset failure has become easier with the advent of algorithms and sensor technologies which capture data where and whenever you want from different sub-systems and transmit information through a cloud-based environment where it can be analyzed and presented to different stakeholders for real-time decision-making.

- **Prescriptive**
  This goes beyond predictive maintenance, not only identifying issues before they happen, but laying out the processes and people necessary to avoid asset malfunction and what actions can be taken to remediate equipment.

- It also provides insights into possible points of asset failure, such as when and—most importantly—why that failure may occur. For example, a pending engine seize that is due to high temperatures, vibration, emissions and even sounds could mean equipment is running low on oil, triggering a work order to inspect, identify and repair.

Aside from mitigating risk, creating a maintenance maturity model and plan provides a more accurate set of data points to properly fund for more safe and reliable operations. Embracing maintenance maturity for specific, mission critical assets also provides long-term benefits including reduced costs, better customer service and optimized resource allocation.customer service and optimized resource allocation.

“We completed two federal, one state and several King County audits over the past four years after having received a State of Good Repair grant. We simply open our asset management system and go through the audit requirements in real time. Preventive maintenance schedules for critical assets can be reviewed during the audit meeting, printed on the spot or emailed. We just don’t worry about audits like we used to.”

Jeff Lai
Functional Analyst IV, King County Metro Transit Facilities
Workforce Management

05

Getting there

With a large array of assets at play, transit agencies and organizations need to understand which are most important. Then agencies can hone in on those assets and move them through the Maintenance Maturity Model. This involves modeling, budgeting and reporting.

1. Start with a situational awareness of which assets are most important to the organization's key performance indicators (KPIs). Identification is made easier through condition sensor technologies, including vibration, heat sensing and metrics such as hours on the road.
2. Cultivate a detailed register of the digital operational twin data components involved in providing service for safe and reliable transit, including labor, materials and tools.
3. Create a method to obtain quantified and qualified statements of condition for those components, such as the State of Good Repair, which governs transit in the United States.
4. Assign budget numbers to each asset and its maintenance mode to understand what any plan or action costs.
5. Automate how data is gathered, where possible, to support quantified and qualified statements of condition.
6. Produce real-time situational awareness of all component conditions. Include who or what collected that data, as well as when and how it was gathered.

The universal importance of safe and clean

The entire transportation industry, whether moving people or not, is under intense scrutiny for safe and clean practices—by both consumers and government agencies. This means that health and safety practices and protocols have become as important to transit and transportation safety as equipment maintenance. Any modern asset management plan should record, digitize and track health and hygiene practices and be able to answer these questions about each asset:

- Are they clean?
- When were they cleaned last?
- Who cleaned them?
- Were cleaning personnel trained on new regulations?

What's more, transit and transportation agencies should be able to trace and track any contagion using real-time data on inspections as well as third-party suppliers and contacts.

06 Relying on the roadmap

When an organization lays out an accurate and reliable depiction of each asset, staff and leaders can begin to build a roadmap of actions and priorities. From there, they can start putting plans into practice.

While achieving a prescriptive maintenance level for its most crucial assets is the goal, it should also be recognized that it requires a full repository of maintenance data, including schedules, checklists, staff certifications and experience, and the digital tools to make that data collection possible. This is, however, simply not possible to gather for every asset, so agencies must continue to be mindful of priorities.

While prioritization is important, organizational change can be difficult, and a plan is only as good as the people behind its execution. In order to support staff:

- Develop clear, ongoing communications around new and changing processes
- Clarify roles and responsibilities through an accountability structure
- Bring together a cross-functional working group to regularly monitor progress, and change course if necessary
- Include training and certification needs in any plans

"Having multiple departments across the agency join a true enterprise platform and being able to utilize the power of enterprise data management, has truly helped our agency in its overall asset management goals."

Michael Tedrow
EAMS Program Manager, San Francisco MTA

07 Embracing a modern asset and work management solution

A modern asset and work management culture is supported by IoT technologies. Transit and transportation providers can start to build a modern and sustainable maintenance maturity management plan by collecting and digitizing key data around the policies, people and practices involved in maintaining and optimizing assets.

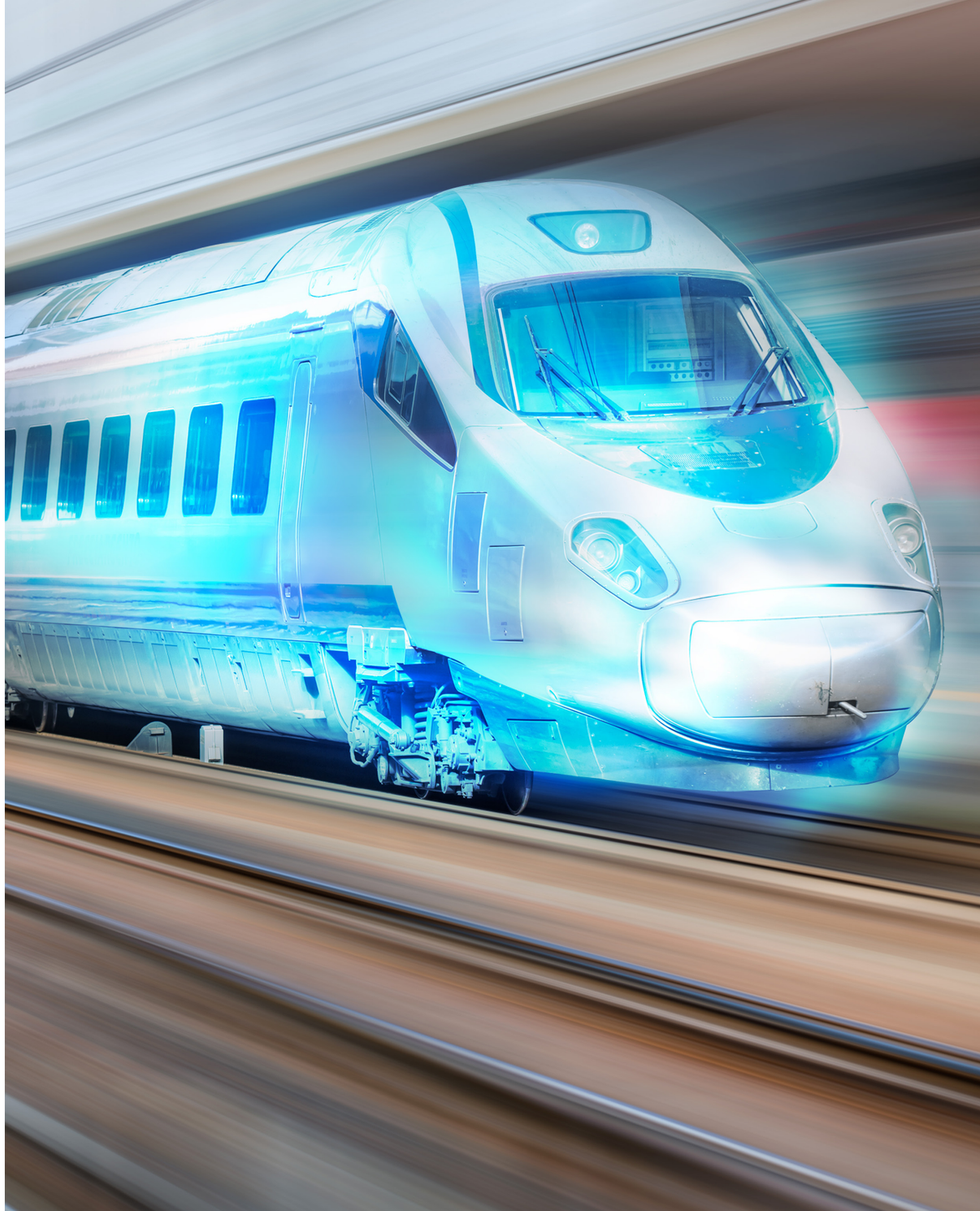
Transit and transportation agencies are finding that enabling mobility among staff allows real-time data input and collection around work checklists and monitoring. Those same mobile capabilities hold key data on workflow, staff qualifications and certifications.

That enables short-term transactional reporting, but also ongoing business intelligence, and long-term asset performance management. What's more, agencies are always audit ready, which is especially important in an era of enhanced safe and clean protocols and practices.

09 Finding the right partner

When implementing solutions to increase your maintenance maturity, look for a technology partner that understands the reality of transit and transportation asset management challenges. In most cases, legacy and on-premises solutions no longer provide the sensor, predictive analytics and autonomous operation technologies needed by today's transit agencies. Cloud deployment ensures the following:

- Scalable and extendable subscription-based system delivery
- The unburdening of agencies from system upgrades and maintenance
- Complete connectivity across all systems to ensure an audit-ready, single source of truth for any EAM data
- The potential for implementation of emerging technologies such as AI, machine learning, and drone technologies
- A scalable platform for the growth in digital work deployment across functions as well as keeping pace with increasing mobile demands by riders



09 Dig into the data

Looking at examples of standard transit and transportation assets, here are some questions to ask while building a Maintenance Maturity Model that provides insights needed for a modern asset and work management plan.

Step 1: Define assets
Is it a point asset, componentized asset, linear asset or an asset with direction?

Step 2: Categorize assets in the model
Using situational awareness, where do specific assets belong on a maintenance maturity model? What are the key performance indicators, such as rider risk and safety, that help make that decision?

Step 3: Derive condition-based KPIs
Using State of Good Repair (SGR), meta-data and KPI, what are the condition-based data—asset history, age, performance—that need to be defined and included as part of the plan, and how do we ensure they are always up to date?

Step 4: Gather data in real time
How do we ensure work is recorded accurately? This is where digital work orders, checklists and integration with meters and monitors come in. Digitally capturing usual activities, such as oil viscosity checks, out in the field is the most reliable way to track activities.

Step 5: Be audit ready
Incidents happen. How do we ensure assets are in the condition we say they are in? An audit grade platform includes software, workflow, qualifications/certifications of labor, budgets and market changes such as increase in ridership and business impact events.

Step 6: Create a dashboard
How do we extract both transactional reporting and strategic business intelligence from the system? What are the key indicators that help us make better decisions?

Step 7: Comprehensive asset performance management
How does the plan build towards an asset management culture that is reliable, sustainable, efficient and cost effective?

09

Creating an asset maturity model requires an agility and flexibility that may not be supported by on-site legacy systems. Look to cloud deployment and functionality built specifically for the industry to facilitate:

- Automation, integration and connection across internal and external systems
- The adoption of existing and emerging tools such as AI, machine learning and drone technologies
- Rapid adoption of intuitive digital work applications

Lastly, according to a report by the United Nations Department of Economic and Social Affairs, by the year 2050, 66% of the world's population will live in cities. This, in addition to unforeseen—and inevitable—interruptions in business continuity as well as the rapid digitization of services across all industries, is creating fresh challenges for today's transit agencies. While safely and reliably moving people will remain a constant through any evolution, agencies should now focus on the technology infrastructure that helps support that core mission.

Learn More

"Our asset management system matches engineer competencies against job scope. This area is tightly regulated, and an engineer cannot complete their job if they are not certified in that area. The system will facilitate a quick reference point to extend efficiencies and support compliance."

Thomas Howat
Information Systems Engineer,
Strathclyde Partnership for Transport (SPT)

About Octave

Octave is a leader in enterprise software, turning data into decisive action and intelligence into your edge. Our software solves for and simplifies complexity, from the design and build to operations and protection of people, property and assets – for any scope, at any scale. For decades, we've partnered with customers to sharpen performance, elevate efficiency and amplify results. From factory floors to entire cities, our solutions are tuned to scale up what's possible from day one onward.

OCTAVE