ZynQ360

Using Asset Visualisation to Optimise Turnaround and Shutdown Planning

WHITE PAPER | 2024

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Introduction

In this era of digital transformation, businesses need to look closely at innovative processes that drive effectiveness and reduce operational costs, while improving site safety and emissions.

To plan, design, build and manage assets more effectively, there is an evolving need for high-quality visualisation-based management tools; this was one of the primary drivers behind the development of the ZynQ software.

A virtual digital twin refers to a visual, digital replica of any physical asset. These digital twins can support with effective management, especially of those assets located in remote or hazardous environments.

Virtual replicas of physical assets, enable users to improve scheduling and predict problems before any turnarounds or planned/unplanned shutdowns occur.

The visual, digital representation provides both the elements as well as the dynamics of how an asset operates throughout its lifecycle, enabling organisations to:

- ✓ Boost capital project performance
- ✓ Maximise asset performance
- ✓ Mitigate delays in plant start-up due to inefficient handover information
- ✓ Maximise cost efficiency with safe, profitable and sustainable asset visualisation tool
- ✓ Empower their workforce. Improving workforce productivity
- ✓ Enable remote teams to access existing assets

Turnaround Key Success Factors

Adopting asset visualisation empowers organisations to pro-actively manage safety risks, optimise resource utilisation, and improve operational efficiency, ultimately leading to enhanced safety and cost control outcomes.

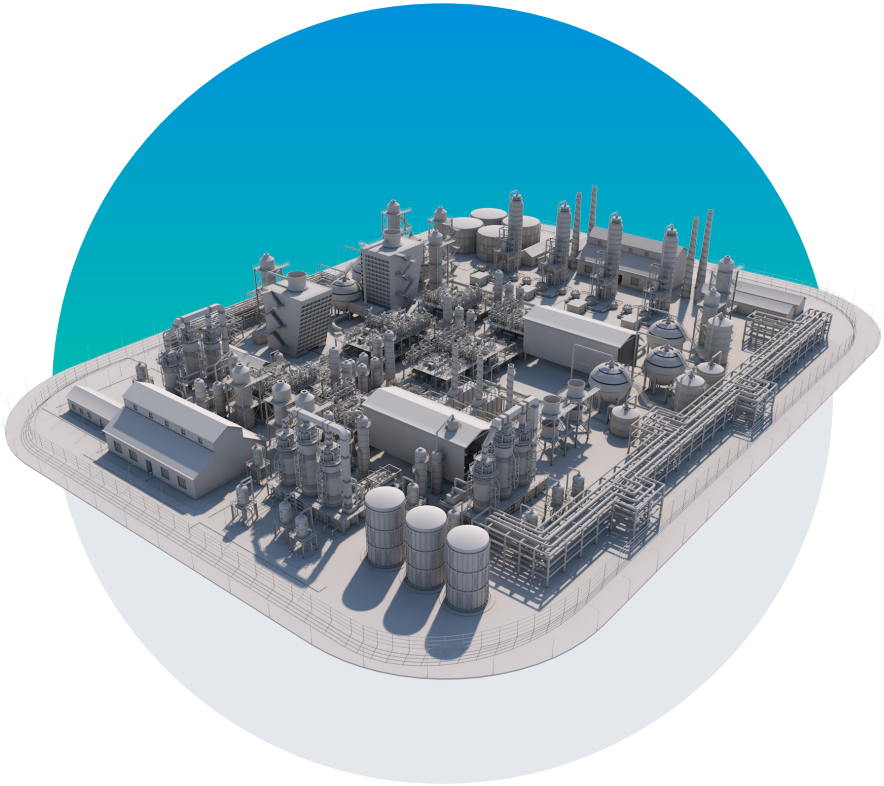
Clear and intuitive visual representations within a visualisation platform will enable effective decision-making and coordination, reducing errors and delays.

1500-2000+

skilled, contractor workers may be brought on-site to perform a myriad of interrelated jobs that require **significant coordination and safety measures during a major unit turnaround.**

Additional personnel vary depending on the circumstances, but it is not unusual to see **staff more than triple during a turnaround.**

x3



Shutdown and Turnaround Critical Factors

- ✓ **Estimated hours**
- ✓ **Health and safety**
- ✓ **Completion of scope**
- ✓ **Environmental**
- ✓ **Cost within estimate**
- ✓ **Personal exposure**
- ✓ **PSSR effectiveness**
- ✓ **Planning accuracy**

Challenges and Trends

Turnarounds are large and expensive.

A description of a 29-day FCC turnaround at Valero's St. Charles Refinery indicated that the event cost an estimated 39 million dollars and used 1800 outside contractors.

Furthermore, it was estimated that **Valero would lose** between **1.2 million and 3 million dollars for each day** the turnaround went beyond its planned time, highlighting the importance of good planning and implementation.*

The main difficulties faced by turnaround planners in the current environment are:

- Forming review teams and validation of every item in the scope against the criteria
- Constant trips to the asset for review
- Ensuring the project scope is reviewed
- Cost overruns
- Ensuring a good balance between risk and cost factors
- Increased work scope
- Shortage of experienced workers and skills
- Abandonment before project completion
- Organisation conflicts
- Turnaround staff stresses
- Not implementing all the recommendations

Source: www.plantservices.com/articles/2006/248/

Indicators of Concern

Leading indicators are a good predictor of turnaround/ shutdown performance - if any of these occur, there is a high probability that one or more of the turnaround targets will not be met.

- Key positions not allocated and not working full-time early enough to allow adequate front-end loading of planning and preparation
- Misalignment of functional milestone plans (between the different functions)
- Work list not restricted per the milestone timing
- Capital projects not appropriated per the milestone timing
- Budget and corporate plan misalignment causes many recycles, diverting resources from detailed planning work
- Late assignment of operations/process resources to planning and preparation efforts
- Issued drawings not up-to-date, creating confusion and the need for re-engineering
- Major execution contractor(s) not in place per the milestone timing
- Key personnel turnover
- Shutdown and start-up plans and schedules not integrated with the maintenance / project work

82% of all turnarounds fail to satisfy performance requirements*

**TA Cook and Solomon Associates*

The financial effect of several unplanned shutdowns can be significant.

A study of 750 turnarounds worldwide found the average project **exceeded cost estimates by 16%.** In some cases, the **budget overruns exceeded 40%.***

**TA Cook and Solomon Associates*

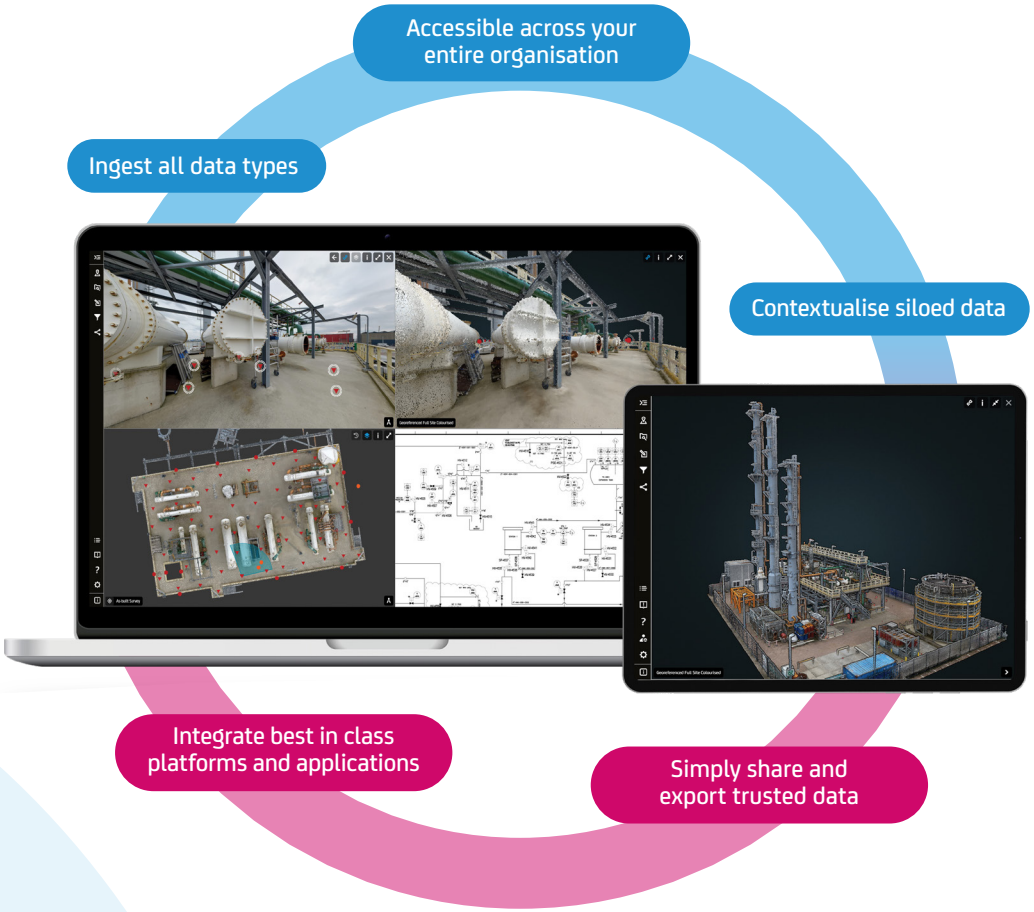
Consultancy group McKinsey & Co. writes,

Better management of shutdown and turnarounds can yield schedule and cost improvements of up to 30%.

Opportunities Enabled by Adopting Asset Visualisation

ZynQ 360 can support singular assets or entire organisations.

By unifying asset data, systems and your workforce in one centralised platform you will reduce complexity and optimise operational performance.



By adopting a visualisation platform like ZynQ, your teams can perform day to day tasks more efficiently, enhancing performance and continuously improving operations.

- ✓ **Reduce operational and maintenance costs**
- ✓ **Increase productivity and minimise downtime**
- ✓ **Improve safety and security**
- ✓ **Enhance stakeholder collaboration**

Four Ways to Streamline your Approach to Turnaround Planning

01. Process Optimisation and Work Scope Management

Work scope management within a turnaround is often one of the most problematic aspects of any event.

Asset owners and their contractors often deal with significant differences in scope, mainly due to the absence of detail in the pre-event scheduling stage.

A considerable part of the scope remains 'unknown' until the start of, or worse, during the execution of the event. Consequently, this has an impact on planning, scheduling, resources and materials. Collectively, this becomes a significant time and cost issue to the asset owner.

By **having access to a detailed digital twin,** users can **effectively source and manage several crucial information sets to provide a more detailed and precise scope of work.**

With respect to the mechanics of scope creation, ZynQ enables users to embrace a thorough approach to work-scoping by **visualising every aspect of the asset while having a historical record of prior turnarounds and shutdowns at their fingertips.** Leading to a decrease in the potential danger of missing critical steps of a job and reducing the time spent creating brand new job packs from scratch.

Providing a historical record of prior turnarounds and shutdowns, assists in scope creation and lessons learned.

02. Unified Supply Chain Management

The key to a productive and profitable working relationship for both asset owners and their contractors is through the transparency of information and having a "single source of truth" shared by both sides.

Naturally, these partnerships of asset owners and contractors commence with the best intentions and established principles on how both sides will work together to produce an efficient, secure and cost-effective event.

However, because of the lack of access to the same information and the same work approval system, the reality is often different.

Ways to overcome this common challenge is to ensure (from an asset owner's point of view) that detailed historical information is present in a centralised platform that provides a clear picture.

ZynQ is a secure, cloud-based platform that integrates new or existing data to create a digital twin of any critical asset and has practical uses throughout the entire asset lifecycle.

This instantly helps to overcome the issue faced by the asset owner's IT policies and procedures, as it may be possible to grant contractors access to the client's internal systems to share the same asset knowledge base.

ZynQ is designed to encourage the cooperative working approach that asset owners and contractors desire.

ZynQ is scalable and can be deployed for a single asset or across an entire organisation. With strict access controls, information can be securely shared between all stakeholders, such as:

- ✓ The Asset Director
- ✓ Operations teams
- ✓ Maintenance and modification teams
- ✓ Reliability and integrity engineers
- ✓ HSE personnel
- ✓ Emergency response teams
- ✓ All external stakeholders

ZynQ enables global collaboration that benefits everyone.

03. Readiness Assessment

Assessing an event's readiness is essential to its success, nothing should be overlooked. It may seem like a straightforward process but having an in-depth visualisation tool will help determine absolute readiness for an event to begin.

Users must have the ability to view both detailed data for specific areas of concern and the general top-level overview. This information should be presented clearly, concisely, and accurately, enabling effective remote asset management.

Access to comprehensive information empowers the Turnaround/Shutdown Manager to make informed decisions about event readiness. Users should be able to assess pre-event information, including job statuses and relevant details, allowing thorough evaluation, decision-making and asking questions such as:

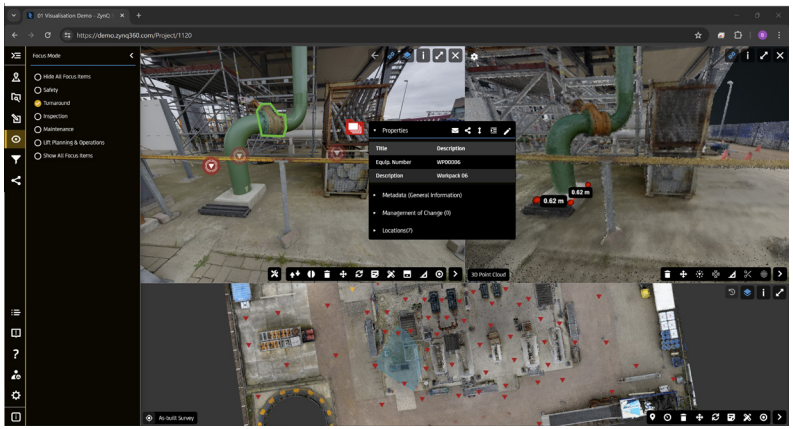
- **Do I have all my location plans?**
- **Have all risk assessments been performed and attached to job work packs?**
- **Am I able to visualise each piece of equipment?**
- **Do I have material take-off completed for all jobs requiring materials?**

For any information that is missing the Turnaround/Shutdown Manager can tag or red flag any aspects that need to be reviewed or completed prior to the event.

ZynQ gives users increased visibility into complex operations, insight and access to data, and the ability to instantly and easily share for effective collaboration.

The virtual digital twin is then truly brought to life and becomes a powerful tool by using key features and functionality such as:

- ✓ High resolution, geo-referenced images
- ✓ Customisable data hotspots
- ✓ 3D model overlays and modifications
- ✓ Geo-spatial tagging
- ✓ Real-time mark ups
- ✓ Measurement capability
- ✓ Third party integration



04. Better Cost Control and Improved Safety

By implementing a visual digital twin for turnarounds and shutdowns, organisations can plan for and identify potential issues and optimise schedules before execution.

This proactive approach minimises downtime, reduces labour costs, and enhances resource utilisation. Safety is improved as well, with the ability to simulate and mitigate risks in a virtual environment, ensuring that all safety protocols are adhered to during the actual turnaround. Overall, the implementation of a visual digital twin for turnarounds and shutdowns not only maximises efficiency but also prioritises the safety of personnel and the integrity of the facility.

With the ZynQ digital twin your project teams can also:

- ✓ Compare data - new, existing and historical
- ✓ Tag equipment
- ✓ Identify hazards
- ✓ Identify Safety Critical Elements (SCE)
- ✓ Tag P&ID and PFD
- ✓ Reduce travel to and around site
- ✓ Experience realistic, immersive training and asset familiarisation
- ✓ Capture workforce knowledge
- ✓ Improve security
- ✓ Take measurements

Reduced site visits translate to a decrease in your environmental impact

04. Better Cost Control and Improved Safety

ZynQ 360 has proven to:

- ✓ **Reduce costs** of engineering *(HVEC and reduced time in field)*
- ✓ **Increase safety** improvements
- ✓ **Increase** right first-time engineering
- ✓ **Increase** right first time construction

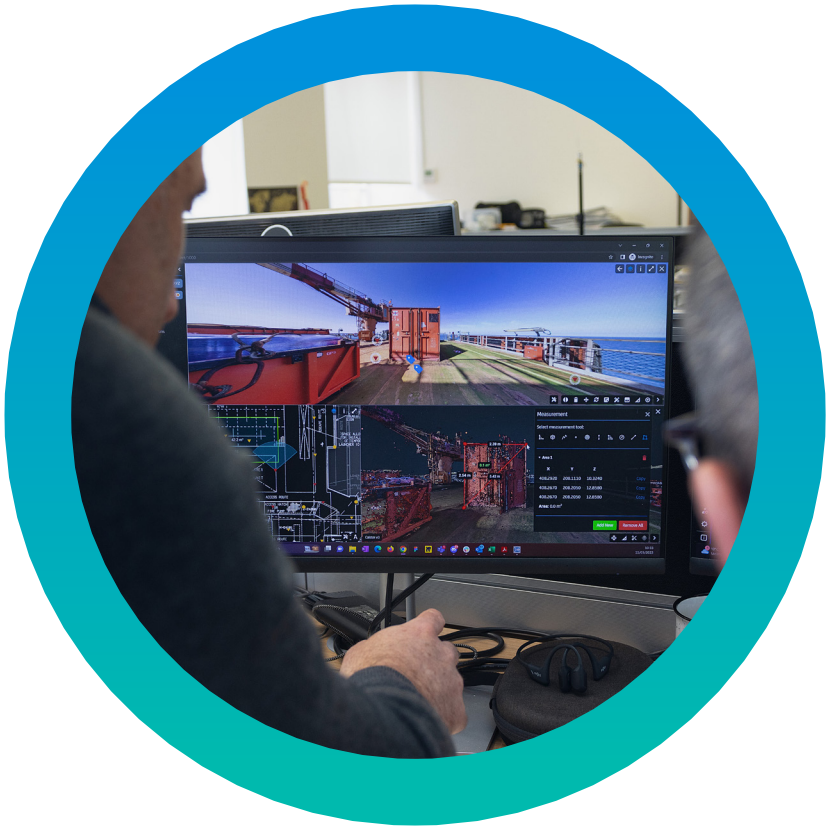
A large US refinery reported savings on turnaround projects after deploying ZynQ as:

Based on 8 medium sized refinery units

$1.6m
yearly savings

Conclusion

Digital transformation is an ongoing journey towards continuous process improvement, involving the integration of people, processes, and assets. Individual procedures and resources are gradually digitised to bridge the gap between operational teams and technology.



Efficient turnaround events are crucial for improved operations and increased company revenues. Turnaround Managers must prioritise effective scheduling and coordination to minimise downtime and costs. The goal is to keep time and costs to a minimum without compromising work quality and, most importantly, team safety.

Successful turnaround planning encompasses scope, materials, actions, and resources, following best practices for efficient execution during planned or unplanned shutdowns.

Adopting visualisation technologies like ZynQ will ensure successful turnarounds by providing precise asset visual data and comprehensive event details to all relevant stakeholders in a simple to use, centralised platform.

ZynQ360

Innovative Digital Solutions to Visualise your Asset

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