

TAI APEX · AI ENGINEERING COCKPIT FOR PLANT ENGINEERING

More than 100 documented use cases. One assistant.

TAI breaks engineering down into **Atomic Use Cases** – narrowly defined, repeatable checking, extraction and automation steps with defined inputs and results. This paper lists all documented use cases, grouped by work area – from P&ID evaluation through compliance checks in the 3D model to CAD automation. Each use case replaces one concrete manual work step.

01–02

P&ID data
extraction, lists &
checking

03–04

Document
consistency &
specification
compliance

05–06

Layout & safety
checks, model
reporting

07–08

CAD automation &
processes across
system boundaries

01 Lists & quantity take-offs from P&IDs

Without a 3D model, from the first day of the project – straight from the P&ID documents.

Generate equipment list (EQUI) from P&IDs

Equipment list from day one for procurement and HAZOP – instead of weeks of manual extraction.

Generate instrument list (INST) from P&IDs

E&I list from project start – automatically from all P&ID sheets.

Generate measuring-point list

All measuring points captured in structured form – without manual extraction from the drawings.

Tender quantities & cost estimate from P&ID data

Complete quantity take-off across all P&IDs instead of extrapolation from samples.

Configurable P&ID report export

Results directly in the client- or project-specific column format – no reformatting.

Digitise scanned legacy lists

50 pages of archive lists captured in structured form in around an hour instead of a working week.

Generate valve list (VALVE) from P&IDs

Valve list for early procurement, long before the 3D model exists.

Generate line list (PIPE) from P&IDs

Line list for stress analysis, purchasing and project control from day one.

Extract P&ID data for estimating

Quantity extract (lines, valves, measuring points, equipment) across hundreds of P&IDs in one run.

Engineering lists from an unsorted tender package

Equipment, valve and line lists from 100+ unsorted documents – in hours instead of weeks.

Evaluate colour-coded P&ID markups (brownfield)

Scope lists for revamps straight from coloured status markings (new / existing / demolition).

02 P&ID checking, comparison & reuse

Revisions, redlines and conventions checked automatically – and P&ID data transferred into target systems.

Compare P&ID revisions and mark changes

Every change between Rev. A and Rev. B in minutes instead of days – nothing gets missed.

Compare tag register (XLSX) with P&IDs

Completeness and naming consistency of the P&IDs against the official register.

Determine piping topology & flow direction

Component sequence and flow direction per line – the basis of all line-related evaluations.

Capture hydraulic and pneumatic diagrams

The same evaluations for ISO 1219 schematics as for P&IDs.

Export P&ID data to DEXPI

Vendor-neutral data exchange without manual exports and transfer errors.

Check P&ID redlining conformity

Handwritten reviewer comments recognised and verified against the 3D model.

Check naming conventions in the P&ID

Non-compliant tags recognised before the document review.

Generate functional/ process description from the P&ID

Narrative documentation derived from the drawing instead of a blank page.

Convert PDF P&ID into a native intelligent P&ID

Migration of legacy stock to Next Gen P&ID, COMOS or SmartPlant – instead of redrawing.

Extended P&ID comparison reporting

Structured, exportable deviation reports for QA and formal client acceptance.

03 Consistency between documents, lists & 3D model

Two-way reconciliation across registers, lists, isometrics, MTOs and models – deviations before they cost money.

Check P&ID elements in the 3D model

Gaps between document and model recognised before the next revision.

Check equipment list consistency

3D model complete and consistent with the official equipment list.

Compare tag register (XLSX) with isometrics

Isometrics complete and consistent – before fabrication and erection.

Isometric quality check with automatic report

QA report per drawing: P&ID reconciliation, bill of materials, system breaks – in batch.

Compare ERP MTO with isometric MTO

Shortfalls and over-procurement recognised before they reach site.

Check continuation numbers across linked isometrics

Revision states of related drawings stay consistent.

Compare tag register (XLSX) with 3D model

Missing or wrongly named components identified before construction.

Check valve list consistency

No wrong or missing valves in procurement.

Check isometrics against P&IDs

Replaces the manual highlighter check – 5–10 minutes saved per isometric.

Consolidate isometric MTOs into one overall MTO

Project-wide material list from e.g. 80 individual PDFs – aggregated ready for procurement.

MTO comparison of two isometric revisions

Transparent variation-order checking of subcontractor invoices.

Reconcile support drawings with MTO

Material deviations discovered before procurement instead of on site.

03 · CONSISTENCY – CONTINUED

Check structural steel drawing against 3D model

Section, position and elevation deviations recognised before erection.

Check status of stress calculations

No stress-critical line without a documented, completed calculation.

Check Revit handover model against AVEVA model

Inconsistencies at discipline handover visible immediately instead of months later.

Check support type against stress calculation

A planned "stop" is not silently built as a "rest".

04 Specification compliance in the 3D model

Every component against piping class, datasheet and project standard – comprehensively instead of by sampling.

Check flange specification

Rating, facing, material and standard per line against the piping class.

Check reducer specification

Specification errors on reducers do not reach purchasing.

Check gasket specification

No leaks due to wrong gasket types or materials.

Check bolt specification

No flange failures due to under-specified bolt materials.

Check valve specification

Valve attributes in the model reconciled against valve list and P&ID.

Check fluid & insulation against line list

Consistent data for heat loss, MTO and personnel protection.

Check P&ID number assignment

Seamless traceability between 3D model and P&ID.

Check attribute completeness & tagging rules in bulk

Digital-twin readiness across thousands of elements in one run.

Check flange connections (fconn check)

Incompatible flange pairs recognised before fabrication and erection.

Check orifice plate specification

Correct installation position and straight runs for accurate flow measurement.

Check spectacle blind specification

Reliable isolation for maintenance and commissioning ensured.

Check spacer specification

Dimensional and material compatibility at all flange connections.

Check expansion joint specification

Type, movement capacity and installation position against the manufacturer's datasheet.

Check inline items (e.g. thermowells)

Process-critical inline items complete, correctly placed and oriented.

Check naming conventions in the 3D model

Consistent tags for document generation, MTO and handover.

AI-assisted check plan for model milestones (30/60/90 %)

Around 70 basis-of-design criteria checked automatically before every review.

05 Layout, accessibility & safety checks

Replaces manual 3D review walk-throughs: design criteria checked comprehensively against the model – before design freeze.

Check platform and ladder requirements

Access structures confirmed before design freeze instead of rework on site.

Check nozzle orientation against equipment drawing

Avoid fabrication errors caused by wrongly oriented nozzles.

Check support spacing

Impermissible support spans per DN, wall thickness and insulation found.

Check straight inlet length at pump suction lines

Avoid cavitation and vibration through NPSH-compliant suction runs.

Check maintenance spaces

Withdrawal and access zones at columns, heat exchangers, pumps and furnaces stay clear.

Check foundation elevations

Drainage and maintenance at grade level ensured – no civil rework.

Check instrument accessibility

Instruments readable and maintainable – without climbing on pipework.

Check manhole positioning

Ergonomic access – no equipment modifications after fabrication.

Check drain point accessibility

Drains safely operable – free access from platform or grade.

Check ground clearance at drains

Drain valves remain operable and connectable to mobile containers.

Check tube-bundle withdrawal space at heat exchangers

Maintenance access secured early – no late layout changes.

Check pipe spacing (centre-to-centre)

Erection conflicts on pipe racks recognised early – including flange offset.

Check special supports

Spring hangers, anchors and guides placed in accordance with the stress analysis.

Check valve stem orientation

No unsafe or inoperable valve installations in the design.

Check headroom

Walkways and escape routes free of obstructions and trip hazards.

Check valve accessibility

Every valve safely operable and maintainable – platform, ladder or chain wheel correctly provided.

Check instrument connection orientation

Connections reachable from platform or walkway – no rework at commissioning.

Check operating-element heights

Handwheels and operating elements within the ergonomic range (900–1,500 mm).

Check vent point accessibility

Vents reachable from fixed platforms and walkways.

Check valve operability (handwheel reach)

Report of all inoperable valves before construction.

05 · LAYOUT & SAFETY CHECKS – CONTINUED

Check penetrations (e.g. walls)

Sleeves, seals and fire protection fully specified and documented.

Check expansion legs

Missing thermal-expansion provisions recognised early – no nozzle overload.

Check pipe slope against design criteria

No unintended high/low points, no gas pockets or liquid traps.

Check control valve installation

Operable and maintainable control stations to design criteria.

Piping obstruction check

Clear walkways and cable routes secured in the layout.

Face-to-face dimension check (e.g. instruments vs. manufacturer datasheets)

Around 75 % time saving per check – no dimensional deviations in fabrication.

Clash check

Hard and soft clashes across disciplines – prioritised before fabrication.

Check orientation of eccentric reducers

Avoid cavitation damage to pumps and blowers (flat side up/down).

Check safety valve discharge lines

Permissible back pressure and safe discharge when the valve lifts.

Check straight runs upstream/downstream of valves

Replaces manual run measurement in the 3D review – prevents process deficiencies.

Check vessel connection rules

Flange connections outside the skirt, nozzles correctly oriented.

Calculate maximum support span (iterative, MSS-SP-58)

Rigorous support-span calculation already in basic design – where today it is usually skipped.

06 Model queries, reporting & knowledge access

Answers from model, documents and project archive – by query instead of by research.

Filter and retrieve elements from the 3D model

Targeted data extracts by any criteria – without manual filtering in CAD.

Calculate total pipe lengths by DN/material/spec/PN

Material take-off and cost estimate without manual counting.

Export 3D model data in structured form

Attributes and hierarchy directly for ERP and procurement systems.

Central knowledge access to completed projects

Project experience queryable in natural language – with source references.

Generate design instructions from piping class documents

Rules from every piping class in minutes instead of manual sheet-by-sheet evaluation.

Automatic pre-check against QC templates

The human review starts with a findings list instead of a blank page.

Colour 3D elements by criteria

Faster reviews through visual classification with colour legend.

Piping quantity take-off by size and line

Quantity survey by query instead of manual work.

Cross-document search from the model element

One click on a tag: P&ID, datasheet, isometric, line list and deviations at a glance.

Derive basis of design from projects and standards

Consistent design bases – independent of the designer's level of experience.

Check company standard against current DIN/ISO revision

Silent divergence from amended standards uncovered systematically.

07 CAD automation & generation

From creating and modifying model content to reverse engineering from as-built documents.

Rename 3D elements to naming convention

Controlled bulk renaming with approval – instead of manual work.

Create pipelines in the 3D model from P&ID data

Basic structure with FROM/TO attributes built automatically.

Create GPWL work lists in natural language

Worklists by command instead of click sequences in the 3D tool.

Reconstruct 3D pipe model from existing isometrics

Opens up brownfield and revamp projects where only paper records exist.

Automatic pipe support placement to design criteria

First support layout rule-based – the engineer checks instead of places.

Generate 2D drawings from the 3D model

Drawing production as an automated follow-on step instead of manual rework.

Check laser scan against as-built documentation

Visible where drawing and plant reality diverge.

Generate P&ID lines from the 3D model (reverse engineering)

Bring the P&ID up to as-built status – without manual re-entry.

Generate isometrics with custom configuration files

Project-specific iso generation in batch – without switching configurations.

Equipment modelling from 2D manufacturer drawings

3D equipment including nozzle positions – without manual remodelling.

Process hand-drawn / photographed archive isometrics

Material lists and geometry recovered from paper drawings.

Generate catalogue parts from manufacturer datasheets

E3D catalogue maintenance from parametrised drawings – per size.

Explain iso generation errors and recommend actions

Plain-language explanation plus a concrete next step instead of cryptic messages.

Link laser scan data with P&ID and model tags

Thousands of measuring points assigned automatically instead of manually.

08 Data & document processes across system boundaries

From supplier documents through E&I design to site – wherever data is retyped between systems today.

Generate chemical data list from safety data sheets

Around 4 hours of manual transfer become around 3 minutes per list.

Analyse the impact of changed supplier datasheets

Affected scope and engineering effort quantified immediately – a negotiating position towards the supplier.

Evaluate PLC circuit diagrams (EPLAN) & transfer redlines

Decades of markups survive the system change – across hundreds of thousands of pages.

Detect data inconsistencies across system boundaries

COMOS, EPLAN, Creo, AutoCAD & Office reconciled automatically.

Compare supplier quotations against equipment specification

Technical bid comparison parameter by parameter – with source reference per quotation.

Populate client-specific datasheet from Unified Engineering

Serve client formats – without project-specific attribute mapping.

Transfer sensor/actuator functions from mechanical to E&I

Discipline handover without manual re-entry of function assignments.

Which of these use cases saves you the most?

20-minute Engineering Risk Scan: together we identify one resource-intensive checking process and assess its automation potential – concrete, without obligation and without a slide marathon.

Book an Engineering Risk Scan →

contact@tiger-solutions.ai · www.tiger-solutions.ai



booking.tiger-solutions.ai