

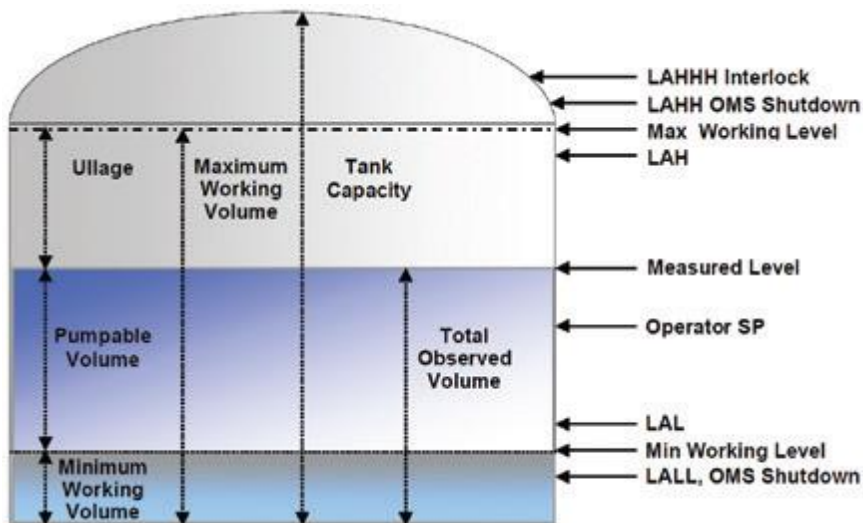
# Bulk Stock Movements, Inventory Management, Logistics Solution

## Introduction

Parijat Controlware, Inc. (PCI) refinery Off-sites, Terminal and Tank Farm management solution provides accurate, reliable and accessible real-time product inventory, movement information, transfer automation and optimization. Enhanced automation and data management for bulk product supply chain reduces quality giveaway, avoids reprocessing and improves accounting accuracy. The Solution results include reduced HW, SW product cost and faster time to cash, increasing customer satisfaction.

Solution is designed to track raw materials, feed-stocks and products through an entire plant or terminal for continuous and batch-based processes.

Tank gauging section accurately calculates the inventories based on ASTM/API tables, volume, temperature, density corrections. Solution also estimates flow rates (if meters are not present) & continuously updates the time-to-completion, time-to-limits figures.



Incorporating mass balancing techniques solution interprets raw measurements and other data in terms of transfers of material, equipment usage inside the facility. It is able to accurately track



movements, even when there are multiple flows in and out of individual tanks. Any imbalances are highlighted & helps with their root cause analysis.

Solution provides operators with accurate live information on the material movements between tanks and other process units like vessels, rail cars, trucks, pipelines assets. A comprehensive alarm system is available to predict & warn operators of abnormal and hazardous operations. Operators can supervise the equipment safely, accurately and productively.

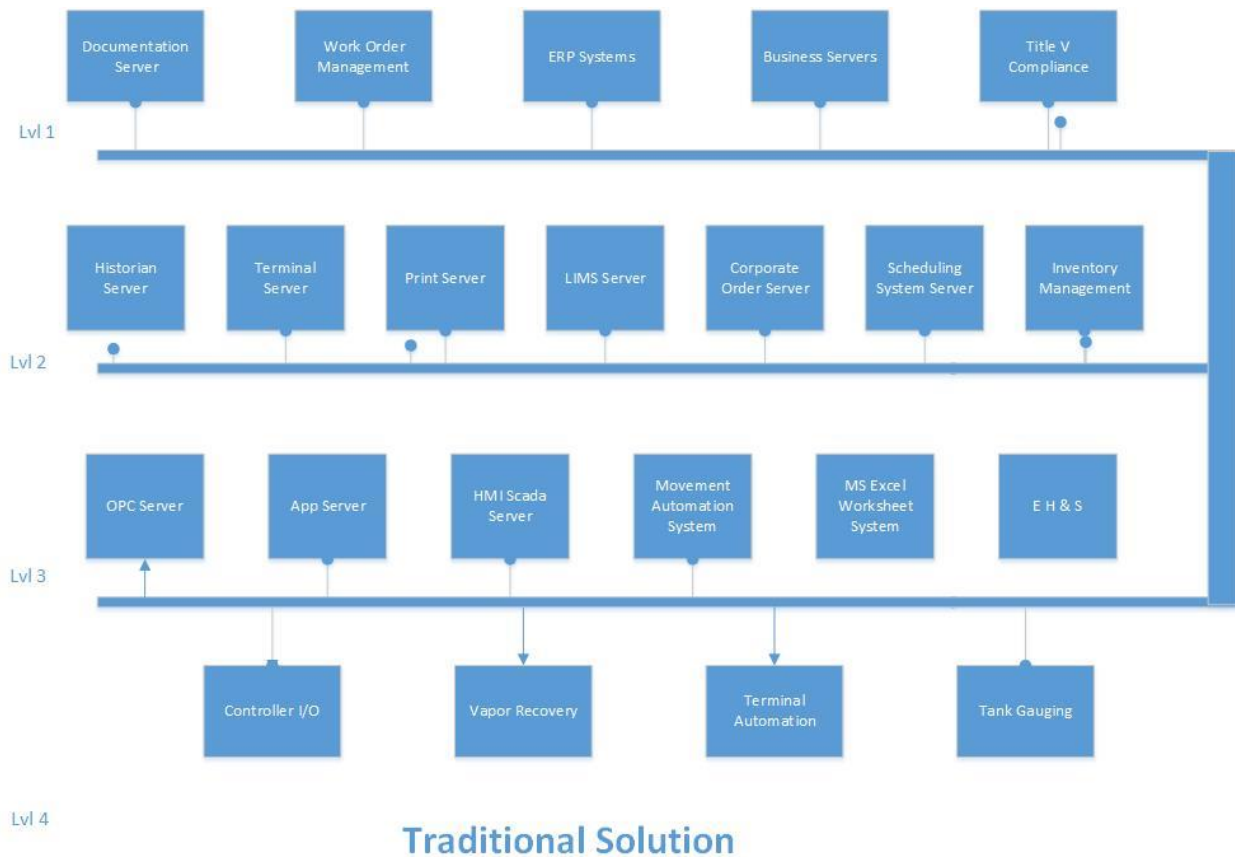
Although developed for use in terminals, solution is applicable in any plant handling fluid materials

- Solution is particularly designed to operate in plants where full automation of all pumps and valves does not exist but works for other scenarios also.
- Smart process graphics & intelligent robot 'objects' eliminate any duplication of labor by driving them via meaningful relational database data.
- Easily configurable rules & facility specific topology to optimize product movements & path selections.
- Equipment assets & tasks are handled as intelligent 'objects' interconnected with other objects smartly to help correlations. Topology of these assets is graphically presented as an intuitive PFD format.
- Product rundowns & storage tanks & other assets 'know' the relationships & rules with pipe segments, capacities, valves, pumps etc. This ensures preventing potential damage, human errors, product cross-contamination, degradation & regulatory needs.
- Movement or transfer automation section handles automatic, optimal (or manually) path selection, verification of equipment availability, check product compatibility, execution using Artificial intelligence technologies, Big Data, expert systems & a facility specific knowledge database. Two path isolation approaches are employed:
  - Optimal – minimum isolation actions by seeking each branch of the piping network off the selected path looking for open connections to tanks and manifolds that are not part of the transfer. Isolation valves are identified only as required to close those open connections.
  - Explicit – All valves that are not in the flow path but are adjacent to the path pipe segments are identified, whether they are currently in the correct position to provide isolation or not. This enforces the state of all valves, and so guarantees isolation independent of other transfers.

The process graphics illustrate the paths unambiguously to facilitate the operator in decision support.

Any operator requested changes not done under auto sequence control (e.g. request to open a valve) result in a warning against any element changes that would have potentially undesirable effects, for example:

- Joining two movements that were previously isolated
- Opening a movement to a tank or manifold
- Blocking in a line segment, potentially causing a thermal relief problem



- Intrinsically safe mobile iPads, Androids or Microsoft Surface units may be used for field personnel collaboration or telepresence applications with the control room & other subject matter experts. They all access the same central data pool to avoid any traditional human error-prone activities. SOP & equipment discrepancies from desired states are available. RFID, iBeacon SensorTag, EddyStone & MQTT protocols for IoT etc. are supported to ensure synchronized data updates globally for workflow procedure execution, event tracking, validation, manual data collection.



Parijat Controlware, Inc.



- Blending control & optimization provides interface with almost any OEM system, supporting recipes, any LIMS or analyzer interface, to manage statistical, live instant reactions to control off-spec blends. Also handles any tank-to-tank or tank-to-external deliveries for continuous rundown operations for controlled & wild streams.

### **What Problems Does It Solve?**

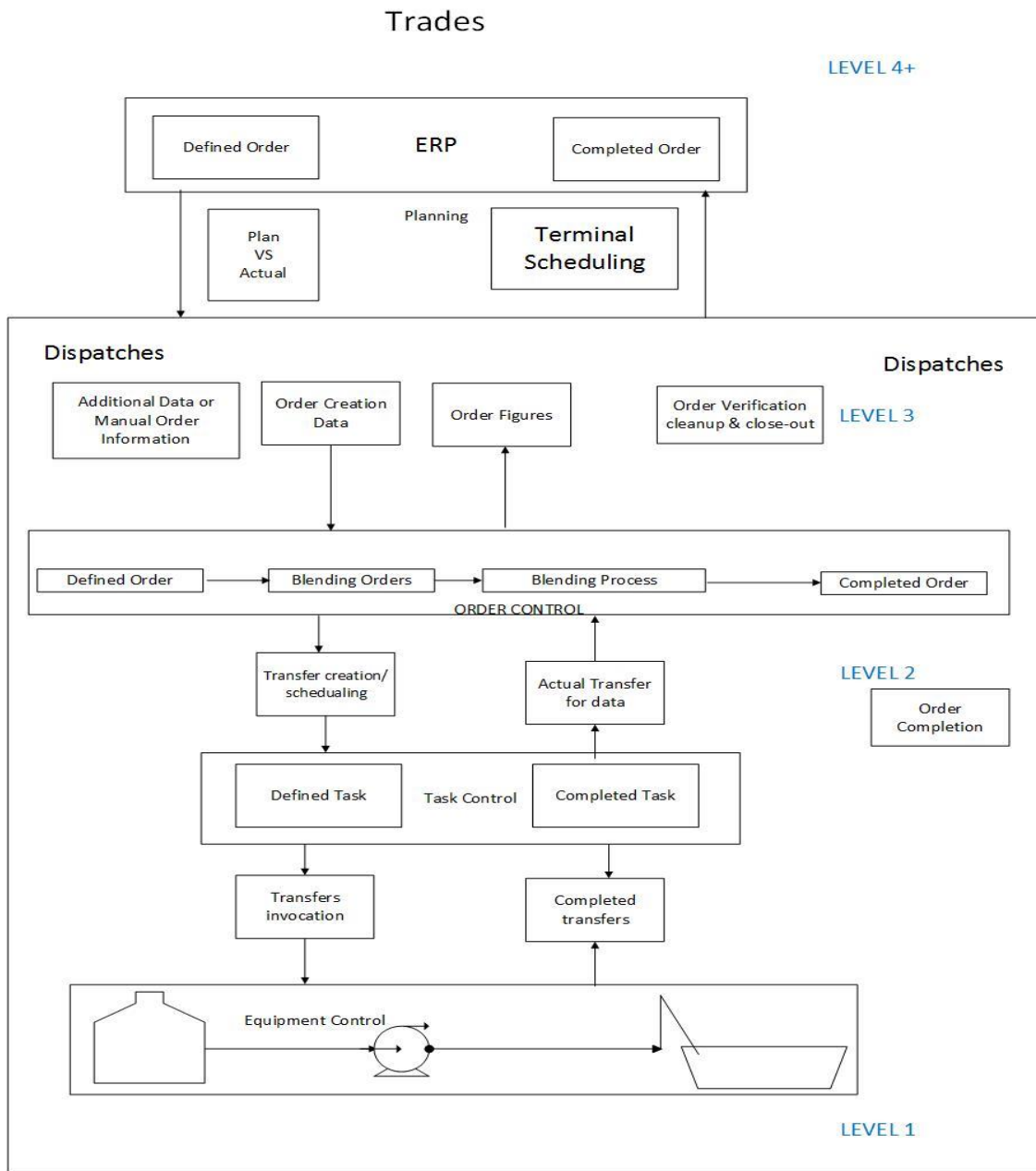
Users can harness, mine data and information from across the enterprise about the solution (via any desired means like desktops, mobile devices, browsers etc.) to achieve major improvements in the operation, including:

- Unmanned operations.
- Increased operator effectiveness for manned operations
- Operator fatigue mitigation
- Optimized material flow & compatibility check



- Relieve traditional ERP from real-time decision support & logistics
- Automatic optimal route/path pick, line-up, source/destination swing, startup, shutdown, flushing/stripping task suspension/resumption & data reporting. All events' relevant data throughout the transfer lifecycle is recorded.
- Review of all operations before commitment. Selected assets, resources are unavailable to other transfers till released.
- Minimize manual field operations, displacement volumes.
- Reduced downtime due to advanced diagnostics & I/O override capabilities.
- Enable/disable use of any field devices to support maintenance downtime or turnarounds.
- Fill in blanks methodology permits rapid modifications after solution's initial deployment.
- Automatic or manual scheduling, translation & execution of product transfers.
- Standardized, simplified work flow processes – dynamically reallocate assets, resources to suit your daily changing requirements.
- Docks management for vessels with ETA, lay date, berth assignment. View in a Gantt chart to mitigate demurrage charges & improve general management.
- Manage comingled product in leased tankage for independent terminal operations.
- Product transfer data may be modified or corrected against archived data maintaining Sarbanes-Oxley standards for auditing.
- Continuously updated lean terminal operations – eliminate manual operations & use of multiple spreadsheets.
- Avoid slopping due to cracked open valves
- Optimized preventive maintenance, powerful system & hardware diagnostics
- Configurable PLC I/O system, enabling quick retrofit, complementation or upgrade of existing system w/o affecting existing wiring & equipment
- Support unlimited number of assets like tanks, valves, pumps, pipeline segments, areas, per facility - unlimited facilities & multiple control systems per facility.
- Provides support for hand (manual) valves via inexpensive live monitoring smart appliances (no wiring & extremely low power consumer) & operator handheld mobile application.
- Electrical substation equipment, relays, power management system, electrical events, waveforms capture & harmonics detection. Process & electrical data from IEDs, VFDs presented simultaneously.
- Environmental reporting for EPA AP42 or Title V permit compliance. The emission losses incorporate the breathing, evaporation, relief valve expellation etc.
- Any missing or desirable features will be added on request.
- Documentation provided may consist of complete sketches of P&IDs, etc. Details of system electrical drawings, user manuals and wiring for each section of the system.

Typical workflow:



All of PCI employees are H2S and Land Safety Trained & have completed the IDAC HSE Rig pass course which includes SafeGulf and SafeLand USA.

10/30/2015