Planning for a Sanitary Process Expansion without Disrupting Production

A Technical Brief and Practical Guide

Prepared by Kodiak Process & Installation

Executive Summary

Expanding an operating food or beverage facility requires a plan for maintaining production as well as a design for added capacity. New equipment can be ready while a shared utility, cleaning circuit, controls interface, or final connection remains unresolved. Those interfaces often determine whether production resumes on schedule.

The practical objective is to prevent unplanned disruption, preserve unaffected operations, and contain necessary shutdowns within approved windows. Some connections require a controlled outage. A credible plan identifies those interruptions early and includes the time needed for isolation, installation, testing, cleaning, and production release.

The most effective approach is to verify existing conditions, complete independent work before the outage, and release each transition only when its prerequisites are satisfied. This guide addresses tie-in planning, temporary utilities, isolation boundaries, shutdown sequencing, contractor coordination, startup risk, and contingency planning for brownfield sanitary process expansions.

Why Expansion Planning Matters

A brownfield expansion adds or modifies systems within an existing facility. Unlike an isolated new installation, it may depend on equipment, utilities, personnel, and access routes already committed to production. A connection serving one new line can interrupt several existing users if those dependencies are overlooked.

Start with an operating baseline: products and production rates, sanitation cycles, utility demand, storage capacity, maintenance needs, and permitted outage windows. Define which lines must remain available and which can run at reduced output. Evaluate these conditions across production, cleaning, changeover, and startup rather than against a single average operating point.

Agree on success measures with plant management before finalizing the construction sequence. Useful measures include outage duration through production release, performance of unaffected lines, completion of acceptance checks, and time to stable operation. Mechanical completion alone is an incomplete measure.

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Establish the Expansion Boundaries

Walk the proposed scope with operations, maintenance, engineering, quality, sanitation, safety, controls personnel, and the installation team. Reconcile piping and instrumentation diagrams with field conditions. Trace common supply and return paths; confirm instrument tags, valve locations, equipment connections, elevations, and access.

- Identify shared dependencies such as clean-in-place (CIP) supply and return, water, steam and condensate, refrigeration, compressed air, electrical distribution, drains, and automation networks.
- Verify equipment delivery paths, lifting access, structural support requirements, maintenance clearances, and space for inspection and cleaning.
- Record uncertain conditions in an issue register with an owner, a resolution date, and the work that cannot proceed until they are resolved.

Develop a marked drawing for each construction stage showing operating systems, isolated systems, new work, temporary services, and the intended next configuration. These stage drawings help prevent assumptions about which routes or utilities are available during a transition.

Tie In Planning

Manage every connection to an existing system as a defined work package. A tie-in register should identify the connection, affected users, required production state, isolation arrangement, installation scope, inspection needs, cleaning requirements, responsible owner, and restoration method. Include utility, electrical, controls, and drain connections alongside product piping.

Verify Before Fabrication

Field-check materials, connection sizes and types, equipment orientation, dimensions, elevations, and the condition of existing tubing. Confirm space to cut, fit, weld, inspect, and restore insulation where applicable. Use verified information to prefabricate suitable spools and assemblies, while retaining planned field adjustment at uncertain interfaces.

Review how each new branch affects flow paths, drainability, cleaning coverage, and access. Determine how unused connections will be closed or removed without creating uncleanable sections. FDA equipment provisions address cleanability and maintenance of equipment, including conveying and manufacturing systems; the project must translate these principles into application-specific acceptance criteria. [1]

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Define the Release Conditions

Before authorizing a tie-in, confirm that materials are on site, prerequisite work is complete, the isolation is approved, and the inspection and sanitation teams are available. Define a hold point before the existing line is cut. Schedule the last irreversible action only after the team confirms that the remaining work can fit within the available window or the approved contingency.

Temporary Utilities and Production Continuity

Temporary utilities are engineered operating systems with defined service limits. Establish demand for each construction stage, including simultaneous operation of existing production, new-system testing, and sanitation. Check supply and return capacity together; a supply connection alone does not demonstrate that the temporary arrangement will perform.

Service	Questions to Resolve
Water and CIP	Are flow, pressure, temperature, water quality, cleaning capacity, and return paths adequate for the stage?
Steam and condensate	Can the source and distribution support peak demand, pressure control, drainage, and condensate return?
Cooling and refrigeration	Can supply and return maintain the required duty during concurrent production and startup?
Compressed air	Are capacity, pressure, dryness, and air quality appropriate for instruments and any product-contact use?
Power and controls	Are load capacity, protective devices, grounding, communications, and recovery arrangements verified?
Drains and effluent	Can the discharge system accept flushing and cleaning volumes, temperatures, and chemistry?

Specify the temporary equipment, hose or pipe ratings, materials, supports, routing, protection from traffic, and required inspection. Address backflow and cross-connection protection where applicable. Assign responsibility for operation, monitoring, maintenance, alarm response, and removal. Identify a loss-of-service response before relying on the temporary supply.

Test temporary services under representative demand before disconnecting the permanent service. Verify the changeover sequence and its effect on operating users. Record the

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approved configuration so temporary connections do not become undocumented permanent modifications.

Isolation Boundaries

Separate Energy Control From Hygiene Control

Personnel protection and contamination prevention require separate reviews. A construction barrier does not isolate hazardous energy, and an energy isolation does not establish a hygienic separation from operating production. Document both boundaries on the stage drawings and assign responsibility for maintaining each.

For servicing and maintenance covered by OSHA 29 CFR 1910.147, energy-control procedures include isolation and verification; a control-system stop is not an energy-isolating device. Covered work involving outside personnel, group lockout, or shift changes requires coordinated arrangements. Determine the applicable safety requirements for each activity, including construction and electrical work, rather than treating one standard as universal. [2]

The site-approved isolation plan should address all relevant energy sources and connected flow paths. Authorized personnel must establish and verify the required safe condition before work begins. Define how the boundary will remain effective as adjacent equipment runs, shifts change, and systems are tested or restored.

Protect Operating Areas

Assess construction dust, debris, water, personnel movement, material movement, and open product-contact surfaces. FDA plant-design provisions recognize separation by location, time, partitions, airflow, and other effective controls to reduce contamination and allergen cross-contact. [3]

Select barriers and access arrangements through the plant's food-safety review. Plan deliveries, waste removal, overhead work, and cleanup around exposed production. Protect open tubing and equipment during installation. Define who inspects the boundary and who can stop work if containment fails. Remove barriers only after the area and affected equipment meet the approved release conditions.

Shutdown Sequencing

Build the outage schedule backward from the required production release. Reserve time for inspection, functional checks, cleaning, quality review, and controlled restart before assigning the installation window. Include crew availability, access constraints, permit timing, and dependencies between trades.

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The following sequence is a planning framework. The detailed order must reflect the actual system, approved work procedures, and commissioning plan.

Stage	Evidence Needed Before Moving On
Prepare while production runs	Verified drawings; prefabricated work accepted; materials staged; temporary services tested; contractor interfaces resolved.
Stop and establish boundaries	Production handover complete; required isolation verified; work area and hygiene controls accepted.
Install and inspect	Connections completed; required weld and installation inspections accepted; open issues classified.
Test and clean	Approved testing complete; controls checks accepted; affected circuits cleaned and verified as required.
Release and restart	Operations and quality authorize use; operators briefed; monitoring and product disposition agreed.

Identify the critical path and review it at agreed milestones during the outage. Report remaining work and forecast release time, not just percent complete. Protect mandatory inspection and cleaning steps when the schedule slips; use the contingency plan instead of compressing acceptance activities.

Contractor Coordination

Assign one owner representative to coordinate the integrated outage schedule and escalation process. Each contractor should know its scope, work boundary, prerequisites, deliverables, and handover recipient. Make responsibilities explicit where process installation meets equipment supply, electrical work, controls programming, insulation, sanitation, and commissioning.

- Conduct a joint walkthrough and sequence review before mobilization. Resolve competing needs for lifts, cranes, laydown areas, work platforms, and access routes.
- Maintain one controlled set of drawings and one change register. Evaluate field changes for process, hygiene, safety, controls, schedule, and restoration impacts before approval.
- Coordinate permits and simultaneous work through the site process. Assign named contacts and relief personnel for each shift, including inspectors and vendor support.
- Use shift handovers to record active isolations, completed tests, unfinished work, configuration changes, and the next hold point.

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The interface between trades deserves particular attention. A valve installed in the wrong orientation, an unconfirmed instrument range, or an unavailable control-system download can delay startup even when the mechanical work is otherwise complete.

Startup Risk and Production Release

Separate mechanical completion from readiness for production. Define acceptance criteria during design so the installation team knows what evidence the owner will require. Commission the new scope in controlled stages and verify that modified shared systems still support existing production.

Installation and Functional Verification

Confirm equipment and line identification, materials, supports, routing, drainage provisions, valve orientation, instrument installation, and required weld records. Execute pressure or leak testing under an approved procedure that defines boundaries, medium, limits, acceptance criteria, and protection of sensitive equipment. Restore the system to its intended configuration after testing.

Verify instrument calibration, input and output mapping, valve feedback, motor direction where applicable, alarms, permissives, interlocks, and recovery after loss of power or utilities. Review software changes, retain recoverable backups, and check their effects on existing equipment. Complete functional checks before introducing product.

Cleaning and Quality Release

Confirm that cleaning reaches all affected circuits and that added volume or changed routing has been considered in the CIP review. Establish application-specific cleaning parameters and verification methods with the sanitation and quality teams. Where the change affects an established cleaning process, determine whether revalidation is needed. Avoid assuming that a successful water run demonstrates hygienic readiness.

Define disposition of commissioning water, cleaning solutions, and startup product. Establish sampling, hold, and release requirements before the first production run. Quality and operations should accept the release evidence and any remaining noncritical items; unresolved safety, hygiene, or essential-function defects should block startup.

Plan a monitored ramp-up with qualified support available. Track agreed operating measures such as utility stability, process conditions, throughput, and cleaning performance. Close the project only after as-built drawings, operating procedures, training, spare-parts information, and maintenance requirements have been transferred.

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Contingency Planning

A contingency is useful only when the response can be executed within the time and resources available. Before shutdown, identify credible failures such as an unusable tie-in, a failed isolation, dimensional mismatch, unavailable utility capacity, controls malfunction, or an unacceptable inspection result.

For each scenario, name the trigger, decision owner, response, required materials and labor, and effect on production. Possible responses include postponing a tie-in before cutting, restoring an approved original configuration, using a tested temporary service, or restarting unaffected equipment while the new scope remains isolated.

Set the Rollback Decision Time

Calculate the latest time to begin restoration from the required production release: subtract the estimated restoration duration, inspection and functional testing, cleaning and quality release, and an explicit contingency allowance. The result is a decision deadline, not an authorization to restart automatically. Continue only when the revised forecast and release conditions remain acceptable.

For illustration, an 18-hour release deadline with four hours for restoration, three hours for testing and cleaning, and two hours of contingency requires a rollback decision by hour nine. These are planning assumptions, not project estimates. Use site-specific durations and include quality holds or other prerequisites that may extend the recovery period.

Keep restoration components, backups, consumables, and qualified personnel available until the relevant risk has passed. Restoration may not be feasible after certain cuts, removals, or software changes; identify these points of no return and approve an alternative before crossing them.

A Practical Readiness Review

Use a documented go or no-go review before stopping production. An unresolved item is acceptable only if its consequence is understood, an authorized owner accepts it, and it does not compromise the work or release requirements.

- Scope and tie-ins are verified, with current stage drawings and resolved critical field conditions.
- Required equipment, materials, personnel, permits, vendor support, and inspection resources are available.
- Temporary utilities and isolation arrangements are approved, with clear responsibilities and verification steps.

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- The integrated schedule includes testing, sanitation, quality release, and explicit decision milestones.
- Startup criteria, product disposition, operator training, and support coverage are defined.
- Contingencies are executable, with staged resources and a known rollback decision time.

Common Failure Modes

- Planning around equipment installation while overlooking shared utility returns, CIP availability, drains, or control-system dependencies.
- Treating old drawings as verified field conditions or releasing fabrication before uncertain connections are resolved.
- Using temporary services without confirming capacity, quality, monitoring, or a restoration plan.
- Allowing construction traffic or debris to cross an operating hygiene boundary without approved controls.
- Scheduling restart at the end of mechanical work, with no allowance for testing, cleaning, or quality review.
- Delaying a rollback decision until too little time remains to restore and release production safely.

Conclusion

A sanitary process expansion succeeds when each construction stage is compatible with the operation that must continue around it. Verified tie-ins, adequate utilities, controlled boundaries, and coordinated work packages make the shutdown scope more predictable. Clear startup criteria ensure that completion means readiness to produce, rather than simply readiness to test.

The strongest plans move suitable work ahead of the outage, protect time for verification and sanitation, and establish realistic recovery options. Integrating process design, fabrication, installation, and plant operations early gives the team a practical path from added equipment to dependable production capacity.

Technical References

Apply the requirements and standards appropriate to the facility, product, activity, and contract. The references below support the identified regulatory points; the planning framework should be developed into project-specific procedures by the responsible team.

[1] FDA — 21 CFR 117.40 Equipment and utensils

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[2] OSHA — 29 CFR 1910.147 Control of hazardous energy

[3] FDA — 21 CFR 117.20 Plant and grounds

About Kodiak Process

Kodiak Process specializes in sanitary process design, fabrication, and installation for food and beverage facilities-building systems that prioritize cleanability, uptime, and long-term reliability. Contact us at info@kodiakprocess.com or visit us at www.kodiakprocess.com.

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