

Leading Life Sciences

The Value of Precis: Process Engineering

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engineering
+ architecture

Precis projects are guided by a steadfast belief in doing things the right way – even when it means challenging a client's approach. Learn how our commitment to safety, integrated disciplines, and emphasis on seeing the bigger picture can yield positive change.

Introduction

At Precis, we take pride in being trusted advisors to our clients. This means more than a job well done. It means valuing our relationships enough to confidently bring forward ideas to improve the way our customers currently operate. It also means understanding how we fit into our clients' larger business strategies and how our actions leave lasting impacts.

Our core values emphasize safety, quality, and doing things the right way. We know most clients feel the same. But occasionally, we are asked to leverage a client standard or process and find that it is not quite applicable to our scope or aligned with industry best practices. In these cases, we act as an extension of our client's team to communicate and document the issue and develop the right approach. Our clients trust us to assess projects thoroughly, identify potential conflicts, and develop creative solutions to solve problems. We go above and beyond designing systems. We prepare our clients for the future.

Clients know they can count on our expertise, commitment, dependability, and proven track record. Precis supports best practices and the best possible outcomes because:



We don't take anything for granted. Our staff begins every project with a thorough review of existing conditions, field surveys, and guiding documentation. We take the time to understand our clients' perspectives and challenges. We examine everything to identify issues early.

We value collaboration. Our integrated design, engineering, process, and automation teams communicate and cooperate on every assignment – with each other and with our clients. Discipline integration saves time. We can walk down the hall to ask a question or resolve an issue rather than waiting on a consultant teammate.

We see the whole picture. Our integration gives us vision into how every system and process affects another – from MEP to fire protection, from equipment to controls, and from process to automation. This wide perspective provides opportunities to think strategically and add value.

We aren't afraid to facilitate change. Much of the Precis staff has worked on both the consulting and client sides. We've been in our clients' shoes and know their pain points. We're always striving to make our clients' jobs easier so we're willing to speak up when we know a change should be made.

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Process Engineering

Precis process engineers ensure robust processes to reliably manufacture products in a safe and efficient manner. They translate client user requirements into working facilities by specifying the equipment and interconnected components in an efficient layout that ensures quality and meets cGMP and regulatory requirements. Precis process engineers are well-versed in material handling and hazard analysis, able to quickly identify areas of concern. They have keen eyes for identifying opportunities to enhance efficiency and cost-effectiveness for clients. They find the right process and equipment solutions to help clients maximize their investments. In addition, Precis subject matter experts have oversight of every project, imbuing every assignment with a custom approach guided by expertise rather than a one-size-fits-all program.

“The teamwork at Precis is rare to find,” explained Van Zhao, Precis Manager of Process Engineering. “We’re doing the design, but on top of that, we’re making sure whatever guidelines we’ve been told to follow offer functional direction to our specific project. We add value because our engineers, process architects, and automation team are looking together at best practices across multiple industries and projects. Together, we come up with the best solution that makes sense.”

Zhao has nearly two decades of process design, analysis, and project management experience in the pharmaceutical and biotechnology industries. Like others in the process group, she works regularly on projects with complicated



environmental health and safety (EHS) requirements and was first to spot a conflict between a longtime client’s design standards and requested technical design.

Case Study: Alcohol Bulk Storage Tank

A repeat client came to Precis with what seemed to be a simple problem. The company operated a column that required alcohol flushes between batches. Drums of alcohol were delivered to exterior storage sheds. Alcohol was manually fed into a day tank and circulated through stainless steel piping directly to process equipment inside the building. The existing pumps used simple automation monitored by a DeltaV system. Over time, the limited amount of alcohol storage and extensive manual work involved with the small tank were no longer efficient.

The client sought to shift to a bulk tank of over 5,000 gallons in order to increase capacity and incorporate more automation. The bulk tank would be installed within an existing exterior containment area near an existing waste tank. New piping would be tied into the existing supply piping with a new DeltaV I/O panel installed for the new tank’s instruments and valves. Once the new system was operational, the former tank and its associated piping

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and pumps would be removed. An earlier feasibility study had conceptualized this new system.

“In reviewing the study, we realized the client’s standards conflicted with the proposed design,” explained Zhao. “The study didn’t specify the right pump or the application for the type of tank needed.”

Conscious of safety, the client required both safety hazard meetings and an additional layer of protection analysis (LOPA) review. Due to the highly flammable nature of alcohol, both at full and diluted (70 percent concentration) waste strength, a fire-suppression system with explosion-proof components (e.g., instrumentation, wiring, controls) was required, and any mechanized equipment needed to minimize the risk of electrical activity that could spark a fire. For this reason, the existing tank relied on a diaphragm pump near its base. The new pump would be operated with air rather than an electric motor, reducing the risk of fire. The new bulk tank would also require nitrogen blanketing for fire suppression.

Classification and design requirements for both a bulk storage tank and the surrounding area were documented by the client and in OSHA, National Fire Protection Association (NFPA), and local fire codes. But the exact parameters of this size and height bulk tank in this type of constrained site had never been tested to the client’s guidelines.

The client’s stringent standard for bulk storage tanks prioritized safety, yet had only previously been applied to greenfield projects, rather than renovation within an existing site. It recommended



a top-mounted centrifugal or submersible pump to protect against a large leak and to improve maintenance access. The Precis process engineering team quickly realized that this was not appropriate for the project’s bulk tank, which was located in a Class I Division 2 electrical classified area with secondary containment and a height exceeding the lifting capacity of a centrifugal pump. In prior projects, tanks either stored non-flammable liquids, were not as tall, or did not have constraints such as limited space or the need for secondary containment. Additionally, most centrifugal pumps cannot lift liquid to the required height of the tank in this project. Using a submersible pump would require electricity to operate – running the risk of fire or explosion in the tank – and posing a significant challenge to extract in case of pump failure.

Carefully negotiating the conflict between the standard and requested technical design, Precis articulated the concerns to the

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client. Zhao documented the findings, through several revisions, to share with the client team, many of whom did not have engineering backgrounds. She also designed and presented alternative solutions and tank layouts. This effort was not included in the original project scope, but the client empowered and trusted Precis to provide this valued expertise.

The project team ultimately determined that the risk of a bottom flange seal failure is significantly lower than the risk of a top-mounted pump's failure for two reasons. First, the positive displacement pump has seals, and seal failure can lead to leaks. Additionally, the use of an air-operated diaphragm pump at the bottom of the tank provides easy control over low flow rates and eliminates the risk of electrical sparks, making it best suited for flammable liquids and operation in a Class I, Division 2 electrically classified environment. The Precis technical design solution ensures the system can function properly, while minimizing risk, adding long-term value and safety to the site.

The Precis automation team remained engaged throughout to provide instrumentation and sequences that would align with the client's system. Anything Precis proposed for the process needed to be workable with automation, and every safeguard required a new control. In this case, the automation needed to show first and second levels of protection, which Precis could develop because of its integrated automation and design disciplines.

To help the client address such a conflict in the future, Precis developed the engineering, calculations, and written format for an



improvement to the standard, working with the client through many drafts to get them ready for presentation at the executive review level, where the changes ultimately gained approval.

Precis Perspective

Precis worked proactively to define and document the issues that resulted in the project's successful outcome. It required time, patience, and depth of experience with hazardous conditions. Everyone on the Precis process engineering team has extensive expertise with flammable liquids. Director of Process Engineering Kristina Pumphrey, PE, even serves as a facilitator for Process Hazard Analysis (PHA), offering an added understanding of hazardous material (hazmat) safeguards.

For the case study example, the process design approach relied on customized 'stick-built' equipment rather than a manufacturer

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package, which required the experience and know-how of engineers familiar with the specific components. Precis quality reviews focused heavily on how equipment might fail, with additional design of the control system and interlocks to prevent failures, leaks, and unsafe conditions.

"The Precis value-add extends from quality to communication. Our in-house engineers and automation professionals collaborate and communicate across all disciplines under one roof. Process engineers can quickly cross-check with colleagues in real time. This integration is particularly important because with many systems, components are difficult or impossible to add later," said Pumphrey.

Taking stringent codes, project parameters, and potential issues into consideration, Precis will design and optimize the best solution. When we identify conflicts, these are relayed to the client and articulated in a manner that both educates and mitigates future risk. Our team's depth means we can solve even the most unique and complex challenges.

From careful analysis and interdisciplinary collaboration to being proactive and confident when addressing challenges, the Precis team makes its clients' ultimate success a priority.

"Even when additional effort is required beyond the original plan, we're committed to doing what's best for our clients," said Zhao. ■

Meet Our Process Engineering Team



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