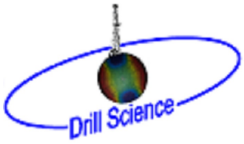

Well Design Process – Order - Disorder - Tools to Reorder Chaos

Abstract

There is a problem with well design process disorders. These disorders seem rather common and yet further research would need to be done to measure and understand to what degree. These disorders delay progress, create many process hazards that then became significant risks during operations and cost lives, time and of course assets.

Introduction

Good Design Order

Objectives Clearly Understood and Locked Down – Constraints Clearly Understood and Locked Down – Environment Clearly defined –Environmental Loads Accurately measured – Degree of uncertainty in Environmental Loads set within Safe Limits that dictate Design Limits – Structural Design – Operational Loads Design - Structural Components Design: Setting Depths(structural dimension):Hole Size/Casing Size:Metallurgy:Weight – Simulations to Focus on Vulnerabilities and Exposures within the envelopes of environmental and operational stresses and structural yield – Procurement

This is simplified as: Obtain Objectives-Define Loads-Choose Material-Simulate Structures resistance to Loads-Refine as needed-Procure material

Discussion

Some important details:

Objectives need to be locked down to prevent changes that cause the entire process to be restarted and introduces the disorders of version control discrepancies that can result in tangibles and/or operations being present that were not in the final, working design. Same thing for constraints. Environment means geomechanics in our case and the accuracy is important to ensure that design assumptions are not subsequentally not followed due to operational realities that are not reflected in the tangible structural equipment already procured and utilized. Environmental loads also include thermal conditions and

subsequent static and dynamic operational loads, and other non common loads such as chemical/corrosive loads like H2S and CO2 and Chlorides and other things as encountered. These all must be locked down first because they impact metallurgy and grades that impact weights for various sizes of casing and tangibles like casing and liner hangers and tubing strings and packers. There is priority and this order must be adhered to strictly to prevent introducing other hazards into the design process such as multiple discrepant versions that reach vendors, team members, procurement and ultimately procedures, operations and critical decisions at performance and safety critical moments on critical elements in the structure. These are not only design integrity issues and yet performance issues and ultimate financial and safety issues. It seems like common sense to state that procurement of material must never be done until the design of the well has passed all of these design phases and is locked down with a high level of quality control and yet this seems to be a common disorder and we need to understand some reasons why and learn tools to combat this.

Disorders

A common disorder is to begin the tangible selection process before the Objectives are understood or before the environment is understood. Common reasons seem to be simply ignorance that the order and discipline is critical to design process management and ultimate asset quality control and yet sometimes it is because the big picture of the time that a complex well requires to be design is miscalculated as related before. Simply that if it takes 1 year to procure certain equipment and 6 months to know the equipment needed then the design process must be 1-1/2 years before spud date. The “Catch – 22” is often used to justify ignoring that the “worst case” timeline must be adopted if there is uncertainty and differences in lead times in the procurement of certain casings that perhaps might be needed, especially in exploration wells deemed complex and outside of the normal designs for any business unit and the knowledge base of its staff and procurement teams and managers.

Excuses for Disorders

Common excuses are that it isn’t to wait for the design to be complete to procure tangibles because of the compression of the timeline. This excuse is too common to simply brush off and ignore? We must find tools to combat this and yet beforehand perhaps we need to understand more about how this disorder in process and logic gets started and keeps being maintained despite its negative affect on morale, distraction, performance and integrity of structures.

The flaw in the logics of excuses for disorder

Many excuse the disorder of procurement of equipment before the simulations are complete because they proclaim that the lead times necessitate procurement ahead of time because the time allotted the design of these critical wells is

shorter than the time needed to procure the tangibles. Now this makes absolutely no sense. The flaw is then in the time allotment. If a “complex well” is given a one year time period for design purposes then the procurement time must fit within this time period. Now if it takes 6 months to get to the procurement stage of the design process and the procurement of tangibles takes 1 year then the entire design process can never be less that 1-1/2 years, in that case. This is simply logic and gut intelligence yet this is a common disorder that I must leave to anyone else to explain. A common saying is, “don’t assign to malevolence that which can be sufficiently explained by stupidity” and perhaps this is the best explanation. Yet we need to examine all of the available tools to explain all of the various reasons for this disorder.

Reasons for the disorder

Some of the common reasons seem to be related to discipline, competence, ethics, politics, ambition/expedience and surely there are more yet let’s get more input from the group brain. One reason is simply lack of discipline. Simply it is too tempting to assume that the design will be “just like the others” in the field and for times sake take the risk of jumping to the conclusions and “ordering pipe” before the design. The risk is if the design is just on the edge in the offset field and this is not recognized and the exploration is being done in a field that is just “a bit” deeper, “a bit” hotter, with “a bit” more pressure, the fact that the new casing will be “a bit” inadequate will create an ethical dilemma and this can also be a political issue and even a competence issue. A person faced with losing “face” or the political power of being wrong in a superficial and rash procurement phase ahead of the design be tempted to perhaps hedge the safety factors or perhaps the loads involved. It’s important to note that these “borderline” design issues are much more susceptible to these disorders because loads “creep” over the strengths of the structures whereas if the depths, temperatures and pressures were much, much different then they would likely always be noticed and care would be taken to protect the “order” in the well design. The key is subtle changes introduce “creep” due to certainty in the uncertainty that is certainly wrong because of the reasons we just discussed. This, we might agree, is the problem that we need to discuss and have tools to combat since someone facing this issue may have many forces and too much stress to navigate alone and without some important tools, leverage and disciplined order.

Tools to combat the disorder

Best practices of the design process must be spoken about among the highest professionals. This will alert process managers and well value assurance professionals to the importance of quality control and process order discipline. Discussing this will alert engineers that they are not alone when faced with these

disorders and with time these standards can become prevalent and protect engineers being “bullied” into compromising their professional, political, competence, and ethical integrity because of disorders that tend to “creep” into the system.

Conclusion

There is a problem with well design process disorders. There is a clearly defined best practice for design processes and they must be adhered to. These best practices must also be studied, talked about and refined in scope and detail in order to become effective in helping engineers and managers faced with the stresses we must withstand everyday in our design process, operations and most importantly constructing wells and delivering our products to the market.