

STRESS
ENGINEERING AND
CONSTRUCTION, INC.
a Stress Engineering Services company

REV IT UP - SAFELY

Improve Your Plant's Performance By Improving

RELIABILITY

EFFICIENCY

VELOCITY



SUBJECT MATTER EXPERTS

Our staff is comprised of Subject Matter Experts in materials, corrosion, welding, fitness for service, maintenance, as well as process, civil, structural, and mechanical engineering. Most importantly, they provide “practical engineering” recommendations to improve plant operations. Our chemical engineers are experts in Aspen and other simulation programs, process flow diagram development, process hazard analysis utilizing multiple techniques, PSM studies and audits, and other safety studies and root cause failure analyses.

A significant part of the value our multi-disciplinary team can bring to your team is experience in solving real world problems. Our staff often assists process plant clients when they have a failure, an incident, a desire to increase capacity, or a concern. Many of our senior staff personnel have major operating company management and technical leadership experience and are familiar with problems you may experience. Of course, confidentiality is a cornerstone of our relationship with all clients.

*Our staff has
significant experience
in delivering Reliability,
Efficiency, and Velocity
improvements.*

REV IT UP - SAFELY

Plant management, operations, and maintenance personnel have three main concerns achieving operational excellence for their facilities:

1. **Reliability** – uptime with no unplanned outages that interrupt the income stream of the facility.
2. **Efficiency** – yield and efficient use of fuel and other utilities are large factors in the profitability of the plant.
3. **Velocity** or throughput – Increasing capacity even marginally with the same assets is a large contribution to plant profitability.

Above all, Safety is Paramount. No one can afford a major high consequence event or incident.

Stress Engineering Services is the expert in Reliability. We are the “go to” folks when there is an equipment issue. We have significant strengths in fitness for service evaluations, equipment inspection, acoustic emission testing, and field measurements. We are continually involved in pressure vessel analysis, piping and pipeline evaluations, corrosion and metallurgy analysis, welding and repair technology, and vibration analysis. We actively participate in technical committees and cutting edge studies of plant operation and industry issues such as low temperature auto-refrigeration / brittle fracture, creep and high temperature materials performance, high temperature hydrogen attack, etc. We have also developed significant skills in process development and optimization, process simulation, process flow modeling including flow/thermal analysis, process control, and process safety. These chemical engineering skills enable us to tackle much broader and deeper plant problems.

In 2014 we started Stress Engineering & Construction Inc., a wholly owned Stress Engineering Services company that can deliver not only correct technical and business answers but also finished process systems starting with expert technical knowledge.

For over 40 years we have been committed to bring clients the “right answer on time”. Now we can extend this for a whole different class of problems. We treat “the cause.....not the symptom”. Our main strengths of technical competence and employee involvement continue with our 100% employee owned company ready to “REV IT UP-SAFELY” for you.

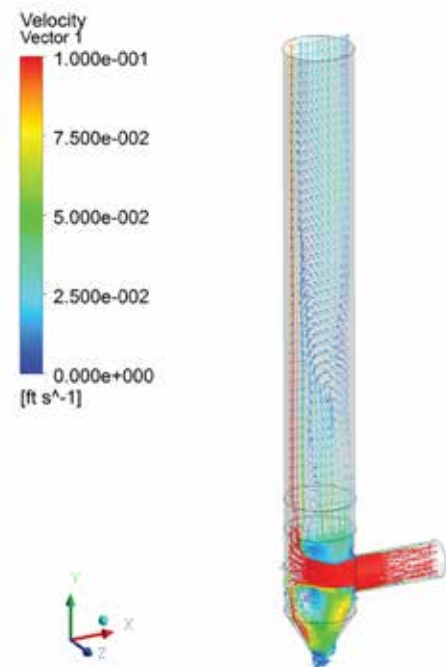
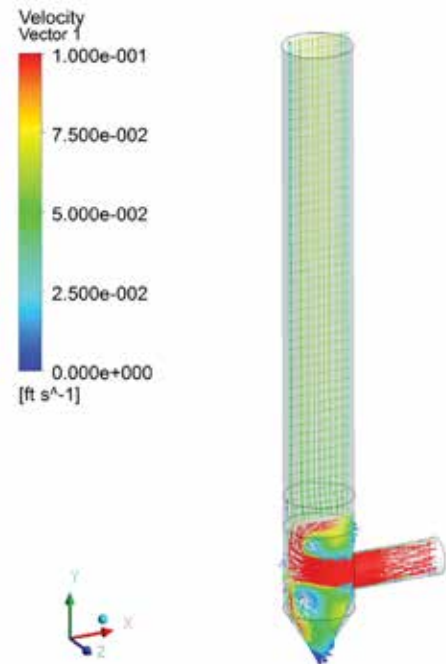
RELIABILITY EXAMPLES

1. Performed a root cause analysis of a near catastrophe in two parallel deep bed partial oxidation reactors fed by a common compressor. The motor failed and one reactor's contents caught fire while the piping experienced deflagration and overpressure. Completed a technical analysis identifying critical safety items and improving safety of shutdown procedures.
2. After a major plant unplanned shutdown with a vessel brittle fracture, we evaluated and recommended required corrective actions for many pieces of equipment subject to low temperatures from auto refrigeration. Combined auto refrigeration, process, data analysis, metallurgy, and detailed equipment evaluations were performed to mitigate the hazard while minimizing equipment replacement.
3. Solved problems of incorrect amine formulation and PSV's plugged with NH_3 salts in amine regenerator in a refinery SRU.
4. A client used a shared pipeline to move diesel and jet fuel to the various sales terminals. After changing to winter blend diesel, water was discovered in the jet fuel. Analysis required extensive sampling. The problem was traced to a corrosion inhibitor, and was fixed with the change to another inhibitor.
5. Our coke drum work on over 100 drums worldwide has reduced failure probability and extended the life of many drums by several years. We provide guidance on drum design, switch and quench procedures, and maintenance plans. At a production cost of \$50,000-100,000 a day and several million dollars to replace a set of drums, our work has been very valuable to our clients.



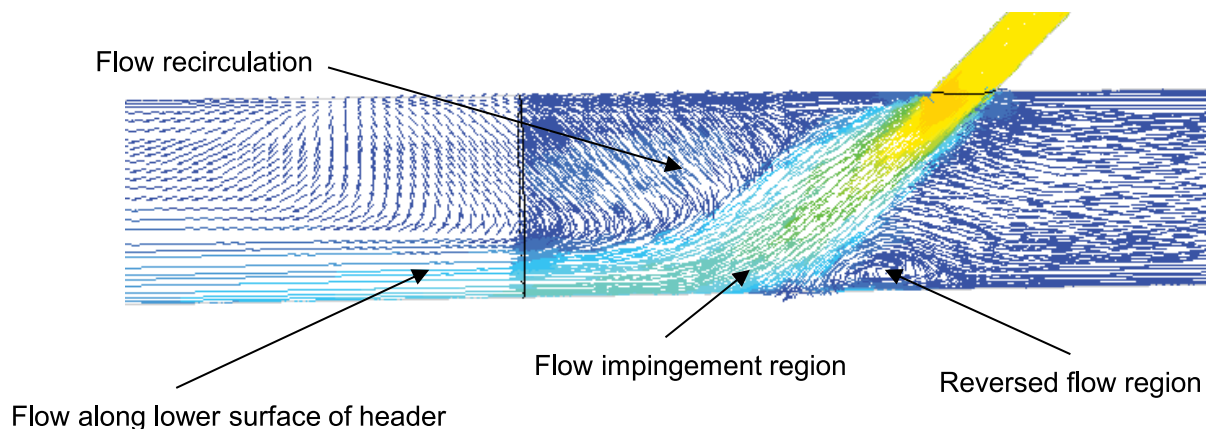
EFFICIENCY EXAMPLES

1. Diagnosed problems of tray fouling in a refinery's Sour Water Stripper. Solution was injection of detergent and small amount of sweet water to process.
2. Conducted work for a client to reduce H_2S to SRU Incinerator. We directed gas from a sour water oil/water separation vessel to a reaction furnace rather than to the incinerator. Improved Incinerator efficiency to >97%.
3. Used flow modeling to optimize reactant Residence Time Distribution by repositioning feed nozzles in specialty chemical reactor; changes increased unit production by \$2-3 million/year, and reduced need for downstream removal and treatment of by-product.
4. Our flow work has also resulted in significant increases in efficiency, better environmental compliance, and reduced operational costs of stacks and scrubbers.



VELOCITY EXAMPLES

1. Increased sour water stripping capacity with a new unit including stripper column, air cooler, reboiler, and other equipment. Work included PSM HAZOP and other process safety analyses. The client is a major Midwest refiner.
2. Developed new technology for converting bottom of the crude barrel to a high-end product.
3. Executed performance measurements and induced flow fan troubleshooting on nine parallel cracking furnaces. Identified corrective flow modifications that increased furnace throughput by 3% each, increasing unit throughput by 27%. Project costs were returned in under one month.
4. An example of our coke drum work is assisting a client with a new center feed nozzle. Our flow modeling of the inlet feed resulted in elimination of impingement and hot spots that cause premature failure. This resulted in a 60% increase in remaining life of coke drums and overall process improvements.
5. Our flow modeling work has resulted in increased reliability of much process equipment by eliminating local high velocity areas and flow impingement. Many famous and costly failures have occurred because of improper attention to local flow conditions. Local flow problems can be routine failure causes.



RELIABILITY, EFFICIENCY, AND VELOCITY

1. Fixed severe vibration and output problems of a Continuous Catalytic Reformer for a Texas refinery. Problems included cavitating feed pumps, chloride attacks on 317ss axial compressor wheel, and replacement of an undersized regenerator. This work saved the refinery \$8 million.
2. Resolved HRSG problems that included vibration, incomplete combustion resulting in discharged CO in violation of environmental permit limits, and inefficient heat recovery requiring \$50,000 per month additional steam purchase. Used field vibration measurements and computational fluid dynamics modeling to redesign combustor flow to fix the problems.
3. Performed a catalyst utilization study in a high throughput Catofin Reactor for dehydrogenation of isobutane with a catalyst bed. By improving the feed flow pattern, the catalyst life was extended from 6 months to 18 months for a \$1,000,000 cost savings for our client.

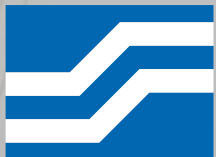




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