

Filed on behalf of Petitioner by:

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

KLX ENERGY SERVICES, LLC

PETITIONER

v.

SAFOCO, INC.

PATENT OWNER

(U.S. Patent No. 9,890,609)

DECLARATION OF GLEN STEVICK

I, Glen Stevick, declare as follows:

1. I have been retained by KLX Energy Services, LLC (“Petitioner”) for the *Inter Partes* Review (“IPR”) of U.S. Patent No. 9,890,609 (“’609 Patent”) and 9,671,794 (“’794 Patent”) (collectively, the “Safoco Patents”).
2. I understand that Petitioner have asserted that Safoco Patents are invalid under 35 U.S.C. §§ 102 and 103.
3. I understand that my declaration is being submitted in connection with the above-captioned IPR proceeding pending in the United States Patent and Trademark Office before the Patent Trial and Appeal Board. I am submitting a separate declaration for the IPR proceeding regarding the ’794 Patent, although a substantial portion of each declaration will be the same.

QUALIFICATIONS

4. I have over 40 years of experience in the general field of mechanical and mechanical-electrical engineering design, failure analysis and risk assessment.
5. My expertise includes mechanical, electrical and computer controls, component design and failure analysis, equipment and product design and development, and material behavior.
6. I received a Bachelor of Science degree in Mechanical Engineering from Michigan Technological University in 1980 and a Master of Science degree in Mechanical Engineering from the University of California, Berkeley in 1981. I

worked at Chevron Corporation, half time from 1977 through 1980 in a variety of positions from coop student to project engineer in the oil fields of Southern California.

7. Following my Master's Degree, I returned to Chevron as an Engineering Mechanics Specialist assisting field engineers with technically difficult problems from the design of offshore platforms for the North Sea, to tension leg platforms to the stress analysis and fluid flow analysis of downhole equipment.

8. In 1989, I returned to the University of California, Berkeley and started Berkeley Engineering and Research, Inc. ("BEAR"). BEAR provides mechanical (including fluid flow and heat transfer) and electrical engineering services ranging from project analysis and consultation to accident investigations and expert testimony. At BEAR, I have designed and assessed the failure of blowout preventors, gas/oil separators, valves, and other subsea and downhole devices.

9. I completed a Ph.D. in Mechanical Engineering at the University of California, Berkeley in 1993 majoring in material behavior and design, and minoring in structural analysis and dynamics and controls (electronic controls).

10. I have served as an instructor for the University of California, Berkeley's senior mechanical engineering design course, "Mechanical Engineering Design," and have conducted various lectures on mechanical engineering topics.

11. I am a registered Professional Engineer in the states of California, Florida, Mississippi, and Texas as well as a member of the American Society of Mechanical Engineers.

12. In addition to my formal education, I have had education, training, and research experience in and with methods and systems used in oil and gas operations, including valves and electronic controllers used in downhole and fracking operations.

13. For example, between earning my Master's and Ph.D. degrees, I worked for Chevron Corporation as an engineering mechanics specialist solving difficult field problems that included how to operate equipment at high temperatures without failure, developing relief and flame arresting systems for refinery plants, underground storage tanks, heat exchangers and well systems; restarting a frozen sulfur pipeline using electric heating without rupturing the pipe; to the startup control of multiple electric motor powered pumps to minimize energy costs and avoidance of hydraulic transients.

14. Currently, I am a Principal and the Director of BEAR. I work in the areas of failure analysis, design, and risk assessment of consumer products and industrial equipment.

15. A copy of my curriculum vitae is attached as Exhibit 1 hereto.

16. I am the author of numerous mechanical engineering publications and reports that are listed in Exhibit A to my Curriculum Vitae attached as Exhibit 1.

17. I am also the co-inventor of the following U.S. patents: U.S. Patent No. 6,119,461, entitled "Thermal-Electric Container;" U.S. Patent No. 9,279,738, entitled "Method and Apparatus for Detecting and Monitoring Oil Spills and Leaks;" U.S. Patents Nos. 7,620,209 and 7,961,912, each entitled "Method and Apparatus for Dynamic Space-Time Imaging System;" and U.S. Patent No. 8,395,376, entitled "Method and Apparatus for Magnetic Response Imaging System."

18. BEAR is being compensated for my time at the standard consulting rate of \$550.00 per hour. My compensation is not contingent upon the substance of this declaration, any statements or opinions made, or the outcome of this matter.

MATERIALS RELIED UPON

19. In forming my opinions stated in this declaration, I have reviewed the Safoco Patents, their prosecution history, the other patents and patent applications noted herein, as well as their prosecution history, and upon the other materials identified herein. I have also relied on my own knowledge, training and experience as an expert in the field of engineering.

LEGAL PRINCIPLES

20. I am not, nor am I acting as, a lawyer. My understanding of patent law and the applicable legal principles and standards comes from explanations provided to me by counsel. I am not interpreting the law or giving a legal opinion.

21. I understand that a patent grants a patentee the right to exclude others from making, using, selling, offering to sell and importing the patented invention within the United States. I understand that the claims of the patent define the scope of this right. I understand that the patent specification describes the invention(s) set forth in the claims.

22. I understand that the claims of a patent may be directed to either an apparatus (or system) or a method. I understand that claims of an issued patent are presumed valid and a party challenging their validity must provide clear and convincing evidence of invalidity.

23. I understand that the question of invalidity is determined from the perspective of a hypothetical person of ordinary skill in the art in the field of the asserted invention as of the date of the claimed invention (“POSITA”). For purposes of this declaration, references and conclusions made regarding a POSITA are intended to reference such a hypothetical person.

24. I understand that this petition asserts that the Safoco Patents are invalid as anticipated under 35 U.S.C. § 102 and obvious under 35 U.S.C. § 103.

25. I understand that the recitation of a new intended use for an old product does not make a claim to the old product patentable. I understand that if a device or process claimed in a patent has been previously invented and disclosed to the public, then it is not new and the claimed invention is invalid as “anticipated.” I understand that, in order to anticipate a claim, each and every element in the claim must be present in a single item of prior art. I understand that in determining whether a single item of prior art anticipates a patent claim, I should consider not only what is expressly disclosed in the prior art reference, but also what is inherently present or disclosed in the reference or inherently results from its practice. I understand that prior art inherently anticipates a patent claim if the missing element or feature was necessarily present in or would necessarily result from the prior art reference. I understand that in order for an element of prior art to anticipate a patent claim, it is not required that a POSITA actually recognize or appreciate the inherent disclosure at the time the prior art was first known or used.

26. I understand that a claimed invention is invalid as “obvious” if it would have been obvious to a POSITA at the time of the patented invention. I understand that obviousness may be shown by considering one or more items of prior art in combination with each other and/or the knowledge of a POSITA. I understand

that, in order for multiple pieces of prior art to render a claim obvious, a POSITA must be motivated to combine the references. I understand that analyzing obviousness is not a hindsight determination and is based upon the knowledge of a POSITA and the state of the art/technology within the field at the time the invention was made.

27. I understand that I must evaluate the following four factors in determining whether a claimed invention is obvious: (a) the scope and content of the prior art; (b) the differences, if any, between each patent claim and the prior art; (c) the level of ordinary skill in the art at the time the invention was made; and (d) additional considerations, if any, that indicate that the invention was obvious or not obvious.

28. In analyzing the differences between the claimed invention and the prior art, I understand that I may consider the inferences and creative steps that a POSITA would have employed in reviewing the prior art at the time of the invention. I understand that a claim is not obvious merely because each of its elements was independently known in the prior art and that I should consider whether a reason existed at the time of the invention that would have prompted a POSITA in the relevant field to combine the teachings of prior art in the way the claimed invention does. This reason may come from the prior art, the background knowledge of a POSITA, the nature of the problem or need to be addressed, market demand, or common sense.

29. I understand that an apparatus or system claim covers what a device is, not what a device does. I also understand that an apparatus or system claim that recites capability and not actual operation may be anticipated by or rendered obvious in view of prior art that is reasonably capable of operating so as to meet the claim limitations, even if it does not meet the claim limitations in all modes of operation. I understand that a method claim may be anticipated by or rendered obvious in view of prior art that is reasonably capable of operating so as to meet the claim limitations if a POSITA would have been motivated to operate the prior art in a manner that satisfies the claim limitations.

30. I understand that, generally speaking, “prior art” is evidence that a patented invention (or one or more claim elements within a patent) was already known or available before the priority date of the particular patent or patent claim. I also understand that prior art can include, for this proceeding, publications and technical journals as well as patents and patent applications.

31. I understand that “analogous” prior art should only be considered in an obviousness analysis. I understand that a reference is analogous if it is from the same field of endeavor as the claimed subject matter or if it is reasonably pertinent to the problems or issues the inventors faced or addressed when making the invention. I understand that prior art from a different field of endeavor is reasonably pertinent to the problems or issues the inventors faced or addressed

when making the invention if it pertains to subject matter that logically would have commended itself to an inventor's attention in considering the problem solved by the patented invention.

32. I understand that, when analyzing whether a patent in its entirety or one or more patent claims is invalid, these analyses should be made from the perspective of a POSITA. A POSITA is presumed to know all prior art that is reasonably relevant. A POSITA is also a person of ordinary skill and creativity who can use common sense and apply prior art to solve problems.

33. When determining the level of ordinary skill in the art, I understand that I should consider evidence such as: (a) the level of education and experience of persons actively working in the field at the time of the invention, including the inventor(s); (b) the types of problems encountered in the art at the time of the invention; (c) the sophistication of the technology in the art at the time of the invention, including the rapidity with which innovations were made in the art at the time of the invention; and (d) the teachings and disclosures of prior art references, such as patents and publications.

34. I understand that, in making the determination of obviousness, I must consider factors referred to as "secondary considerations." I understand that no one factor alone is dispositive of whether a claimed invention was obvious, and I must consider the obviousness or non-obviousness of the invention as a whole.

These factors include: (a) whether commercial embodiments of the claimed invention were commercially successful due to the claimed invention rather than advertising, promotion, salesmanship, or features of the product other than those found in the claim(s); (b) long-felt need for a solution to the problem facing the inventors which was satisfied by the claimed invention; (c) whether others tried and failed to solve the problem solved by the claimed invention; (d) copying of the claimed invention; (e) unexpected superior results of the claimed invention over the closest prior art; (f) praise of the claimed invention in the field; and (g) whether others accepted licenses under the patent due to the merits of the claimed invention.

35. For evidence of secondary considerations to be afforded substantial weight, I understand that the proponent of the evidence must establish a nexus between the evidence and the merits of the claimed invention. I understand that a nexus may not exist where, for example, the merits of the claimed invention were readily available in the prior art. For example, evidence of commercial success driven by unclaimed features of a product or aspects that existed in the prior art will not meet the nexus requirement. In addition, there is no nexus unless the evidence presented is reasonably commensurate with the claim scope that is being asserted.

36. Even if I conclude there is evidence of secondary consideration, I understand that this evidence should be considered along with all the other

evidence in the case in determining whether the claimed invention would have been obvious. I understand that a patent or a patent claim may be obvious in view of the prior art, even with considerable evidence of secondary considerations.

OPINIONS

37. Valves have been in use for hundreds of years. Denis Papin, the French physicist, mathematician and inventor, is credited with creation of the first pressure relief safety valve circa 1680.¹

38. Pressure relief or safety valves (hereinafter, “pressure relief valves”) have been used in downhole oil and gas operations for decades. I personally worked with pressure relief valves in the 1980s and 1990s during my undergraduate and graduate studies as well as in my capacity working for Chevron Corporation as noted above. In my experience, pressure relief valves are used to reduce pressure in a downhole operation so as to avoid an over-pressurized system from causing potentially catastrophic injury to persons and/or property. Pressure relief valves are also noted in *Russell W. Henke*, Introduction to Fluid Power Circuits and Systems (1970) (IPR Exhibit 1005, hereinafter the “Henke reference”) and Chevron Corporation, Instrumentation and Control Manual § 1700 (1999) (IPR Exhibit 1026, hereinafter the “Chevron reference”).

¹ *Continuation of New Experiments*, Papin 1680.

39. Actuators have also been used in combination with pressure relief valves within the oil and gas industry for decades. While working with pressure relief valves as noted above, I also worked with actuators.

40. I have personally worked with two types of valves pertinent to this declaration: fail-safe open valves and fail-safe closed valves. I understand these two varieties of pressure relief valves to be commonly used and understood by POSITA.

41. A fail-safe open valve (or fail-safe normally open valve) is normally open,² and remains open until one or more condition of the system is altered. Commonly, a fail-safe normally open valve has an actuator having a spring, also known as a biasing member, positioning the valve in an open position unless pressure, or another force is introduced and overpowers the biasing force of the spring. For example, a force, such as a fluid force (pressure acting on a piston area), may actuate the actuator such that when a force is applied in the direction of the spring, the spring is compressed thereby closing the valve causing the fluid of the system to be redirected to a secondary route (often a secondary reservoir). In another example, a force, such as fluid force, may be exhausted from the actuator causing

² It is open in its de-energized condition, no external forces applied and the compressed biasing spring is in its most extended position.

the spring of the actuator to expand into an expanded position and open the valve thereby allowing the fluid of the system to be directed to the primary route.

42. A fail-safe closed valve (or fail-safe normally closed valve) is normally closed,³ and remains closed until it is acted on by a magnetic solenoid or a pressure reaching a set level. When this pressure level is reached, the valve opens and permits flow in a secondary route. A fail-safe normally closed valve is held in a closed position by the force of the spring of the actuator. Commonly, a fail-safe normally closed valve has an actuator having a spring, also known as a biasing member, positioning the valve in a closed position unless pressure, or another force is introduced and overpowers the biasing force of the spring.

43. Actuators may be configured to actuate a safety valve between an open and closed position by either inserting or exhausting fluid out of one or more actuator chambers of the actuator. Fig. 3 of U.S. Patent No. 3,198,207 (the “’207 Patent”) shows an exemplary actuator having an actuator cylinder (71), which may have one or more pistons that move under the influence of pressure on a control piston (76). This pressure, which is generally caused by fluid, may be supplied to and exhausted out of the actuator. For example, as shown by the ’207 Patent, pressure may be supplied into the actuator and applied to the piston to overcome the force

³ It is closed in its de-energized condition, no external forces applied and the compressed biasing spring is in its most extended position.

supplied by a spring, thereby causing the piston to move and hold the valve in either an open or closed position. This opening or closing generally causes fluid to be redirected to a secondary route within the oil and gas fluid line system, causing pressure in the overall system to be reduced.

44. Controllers, control systems and control assemblies (“controllers”) have also been used in the oil and gas industry for decades. *See* Henke reference. In my experience, since at least the 1980s and 1990s, computer technology has been used by POSITA in conjunction with controllers to automate, remotely monitor, and operate various aspects of downhole operations in the oil and gas field, including pressure relief valves, in order to maintain the system under standard operating conditions. In my experience, controllers may be programmed to have one or more predetermined condition and may configured to receive one or more signal from a remote sensing device and/or send one or more signal to one or more component of the system in order to actuate the one or more component such that the standard operating conditions of the system are maintained. In my experience, controllers may be connected to or positioned remotely from the oil and gas system. In my experience, controllers may also be configured to communicate a signal to and/or receive a signal from a remote computer system. Such controllers are also noted in the Henke reference and Chevron reference.

45. Prior to the date of the alleged invention of the '609 patent, a POSITA also knew and was capable of combining valves, actuators and control systems as described above in an overall-systems along with various other components including vent ducts, sensors configured to monitor properties of the system, actuators, methods for eliminating ignition sources, and alarms. This is reflected in *Hudson et al.*, A Brief History of Process System Management (IPR Exhibit 1029) at pp. 6-7.

46. Such systems have also been subject to government regulation since as early as 1992. Ex. 1030. These regulations cover written procedures, safety measures, training of personnel, and regular maintenance and inspections of elements of an exemplary system which included at least pressure vessels, storage tanks, valve and piping systems (including valves, relief and vent systems and devices), emergency shut down systems, control systems, sensors, alarms, interlocks, and pumps. *Id.*

47. Tettleton⁴ discloses a pressure relief system. Although Tettleton does not explicitly disclose that fluid is transferred to a reservoir as a result of the disclosed pressure relief valve being actuated, this is inherent to the reduction of pressure within the otherwise closed system that is explicitly disclosed by Tettleton. In

⁴ As used herein, Tettleton refers to U.S. Patent Publication No. 2008/0078586A1, IPR Exhibit 1016.

order to lower pressure caused by increased amounts of fluid in a closed oil and gas fluid line, fluid must be redirected to a different location than the closed fluid line system. This alternative location would be either back to the fluid supply or another reservoir.

48. I believe Tettleton discloses a valve piston 148 and cap 153, which act as a gate (blocking and unblocking flow) within the valve, wherein the valve piston is positioned in the second fluid line that is normally maintained in a closed position to close fluid flow through the second fluid line. This piston operates as a “gate,” as it prevents or restricts the flow of fluid in the second fluid line.

49. The Safoco Patents claim “a valve assembly in communication with the controller assembly,” however, the term “valve assembly” is not defined by the Safoco Patents or their prosecution history. I believe a POSITA would understand the ordinary and customary meaning of “valve assembly” to be a mechanical device that opens, shuts, or partially obstructs material or fluid in a port or passageway that is a part of a machine or structure. This is supported by *Webster’s New College Dictionary* definition of “valve” as “any of numerous mechanical devices by which flow of liquid, gas, or loose material in bulk may be started stopped, or regulated by a movable part that opens, shuts, or partially obstructs one or more ports or passageways, and definition of “assembly” as the “the fitting

together of manufactured parts into a complete machine, structure, or unit of a machine.” *See* IPR Exhibits 1017-1018.

50. The Safoco Patents claim “fluid supplied to the actuator may be pneumatic fluid that is supplied from a rig air source,” however, “rig air source” is not defined by the Safoco Patents or their prosecution history. I believe a POSITA would understand the ordinary and customary meaning of “rig air source” to be a compressor, tank or accumulator that stores pneumatic energy.

51. Dependent claim 2 of the ’609 Patent includes the following limitation: “The system of claim 1, further comprising a housing for supporting the controller assembly, the valve assembly, and the fluid drive assembly.” Cotham⁵ discloses a wellhead having a housing and notes that the housing may enclose any or all of the apparatuses and/or devices used in any of the methods according to the invention. *See* Cotham, at col. 3, ll. 36-39. As Cotham discloses the concept of supporting equipment with housing, I believe POSITA would understand Cotham to disclose “a housing for supporting the controller assembly, the valve assembly, and the fluid drive assembly.” A POSITA would also understand that a housing, frame, skid, or cabinet may be used with a valve system, as a housing, frame, skid, or cabinet may be used with any variety of mechanical structure. For example, in a unibody car, the body of the vehicle also serves as its frame while body-and-frame

⁵ As used herein, Cotham refers to U.S. Patent No. 5,335,730, IPR Exhibit 1019.

designs have the elements of the vehicle (cabin, engine bay and cargo area) sitting atop a frame.

52. Dependent claim 12 of the '609 Patent includes the following: “the method of claim 11, wherein the fluid supplied to the valve actuator by the fluid drive assembly is a pneumatic fluid disposed external to the housing, and further comprising filtering the pneumatic fluid as it enters the housing by the fluid drive assembly.” Tettleton, at [0053], discloses the fluid supplied to the valve actuator by the fluid drive assembly is pneumatic fluid. The same paragraph also discloses that the actuator may be actuated by the fluid from an external source. Cotham, at col. 8, ll. 61-63, discloses a filter for filtering fluid transferred by a pump; i.e., a fluid drive assembly. A POSITA would have understood the “external source” term used in the '609 Patent to a point of origin outside the valve assembly, including the housing disclosed by Cotham.

53. Furthermore, whether or not to include a “filter for filtering fluid as it enters the housing” as used in the claims of the '609 Patent, and where to place such a filter, would have been a design choice for POSITA. Filters are commonly used in fluid operations, including oil and gas operations. Whether and where they are placed are a design choice for POSITA based on the needs and design of a particular system.

54. Cotham discloses that a pressure relief valve may be remotely monitored via a SCADA and a pressure switch. Cotham, at col. 10, ll. 33-35. It would have been obvious to a POSITA, based on at least the general use of computerized technology at the time, that remote operation of the pressure relief valve of Cotham would be by remote computer system communicating a signal to the controller assembly since the controller assembly is configured to alter the position of the valves.

55. Claim 17 of the '609 Patent claims “[t]he method of claim 11, further comprising communicating a signal from the controller assembly to a remote computer system, wherein the signal corresponds to an operational characteristic of the safety valve.” Tubel⁶ discloses a signal that may be transmitted to a remote location that relates to the position of the valve. A POSITA would understand the position of the valve to be an “operational characteristic” is the position of the valve. The term “operational characteristic” is not defined by the '609 Patent or in its prosecution history, however, a POSITA would have understood the “operational characteristic” term to have the widely accepted meaning of the commonly used “operational” and “characteristic” terms, which are “a distinguishing trait, quality, or property” “of or relating to operation” according to the *Webster’s New Collegiate Dictionary*. See IPR Exhibits 1024-1025. Said

⁶ As used herein, Tubel refers to U.S. Patent No. 5,597,042, IPR Exhibit 1023.

another way, a POSITA would discern the ordinary and customary meaning of the “operational characteristic” term to be a trait, quality, or property relating to the operation of the pressure relief valve. Tubel’s disclosure of the signal that corresponds to the position of the valve is the disclosure of a signal that relates to a trait, quality, or property relating to the operation of the safety valve, i.e., an operational characteristic.

56. In my opinion, a POSITA would have been motivated and capable of combining the teachings of Tettleton, Cotham and Tubel to render the challenged claims obvious. My opinion is based on what was known by POSITA prior to the alleged invention of the ’609 patent as shown by evidence cited in this declaration and what was known to POSITA based on my personal experience discussed in this declaration.

57. In my opinion, a POSITA would have known the disclosed elements of the claimed invention and would have understood to combine the disclosed elements for their known purpose to construct the claimed system.

58. Prior art publications that predate the priority date of the challenged claims show that POSITA knew of and used electric control systems for remote monitoring and control of wellhead operations. This is shown by the Chevron reference at 1700-11. It is also noted in the Henke reference, a textbook predating priority of the ’609 Patent. *See* Henke reference, at 201. This is also supported by

Tettleton, which discloses a production control system that gives “real time information” and “automatically [controls] downhole tools in response to sensed selected downhole parameters.” Tettleton, at col. 4, ll. 36-47.

59. Tettleton also discloses a POSITA’s knowledge of a “flow-to-close” and “fail-to-open” valve systems that are actuated based upon measured pressure of fluid in a pressurized apparatus or system. *Id.* at [0008]. Tubel also discloses a need for a production control system that gives “real time information” and “automatically [controls] downhole tools in response to sensed selected downhole parameters.” Tubel, at col. 4, ll. 36-47. Cotham discloses a need for housing wellhead control systems. Cotham, at col. 3, ll. 35-50.

60. Furthermore, as noted above, in my experience, since at least the 1980s and 1990s, computer technology has been used by POSITA in conjunction with controllers to automate, remotely monitor, and operate various aspects of downhole operations in the oil and gas field, including pressure relief valves. In my experience, at or prior to the priority date of the challenged claims, POSITA knew of computer technology and that such technology could be used to improve pressure relief systems by automating and remotely monitoring the same.

61. Based on my experience and my review of the prior art noted herein, the needs and problems to which the challenged claims are directed were known by POSITA at the time of the alleged invention and were also noted in the teachings

of prior art at the time, including the publications noted in this declaration. In light of these teachings and what was known by POSITA at the time, POSITA would have been motivated to combine the teachings of Tettleton, Cotham and Tubel with success to render the challenged claims obvious.

CONCLUSION

62. My opinions above are based on my review of proceeding-specific materials identified above combined with my education, background, and experience. All opinions expressed are to a reasonable degree of engineering certainty, and are based on information that is currently available to me. I reserve the right to provide supplemental or additional opinions if new information is provided to me and to address matters raised in Safoco's response to Petitioner's Petition.

I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct.

Executed on November 15, 2023.


Glen Stevick, Ph.D., P.E.



Curriculum Vitae

GLEN STEVICK, Ph.D., P.E.
Mechanical Engineer, Principal

Bio/Summary

Dr. Stevick has over 25 years of experience in failure analysis and design of structures, consumer products, industrial equipment and medical devices, specifically mechanical-electrical systems; aortic, hip and knee implants; medical cauterizing forceps; turbines and reciprocating engines; automotive and aircraft components; offshore platforms and drilling equipment including pressure vessels/piping/containers, blowout and breakaway devices, heat exchangers and combustion analysis. Engineering projects have involved testing and mathematical analysis of hydraulic systems, fire causation and spread, explosion causation and prevention, structural dynamics, electronic control systems, material behavior, heat transfer and structure/fluid interaction.

Select Industry Experience

- Oil & Gas Industry
- Ultra-Deepwater Well Control, Offshore Drilling
- Earthquake Engineering
- Automobile / Truck / Motorcycle
- Medical Implants
- Medical Devices
- Manufacturing
- Heavy Equipment
- Offshore Oil Platforms
- Maritime
- Blowout and Breakaway Devices
- Plastics / Metals /Ceramics
- Combustible Fluid Containers; Explosions; Fire Propagation & Suppression
- Aviation
- Roofs
- Elevators
- Construction
- Structural Dynamics
- Concussion/Whiplash
- Heat Exchangers
- Piping, Pipelines & Pressure Vessels
- Bridge Dampening Calculations
- Transportation
- Large Structures
- Ships / Sailboats

Education

Ph.D. in Mechanical Engineering from U.C. Berkeley

M.S. in Mechanical Engineering from U.C. Berkeley

B.S. in Mechanical Engineering from Michigan Technological University

Professional Affiliations

Registered Mechanical Engineer, State of California, Nevada, Utah, Louisiana

American Society of Mechanical Engineers

Society of Forensic Engineer and Scientists

Vibrations Institute

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Member of ASTM Committee F15.1

Work Experience

Since 1986 Principal, Consultant

Berkeley Engineering And Research, Inc., Berkeley, CA

Provide consultation in the areas of failure analysis and design failures, including analysis of codes and standards, medical devices and industrial equipment. Failure analysis work has varied from assessing the failure of cranes, medical implants, bone fractures, ladders, chairs, industrial presses, aircraft turbine engines, and propane/natural gas equipment and electronics to the analysis of defective safety devices on compressor/heat exchanger systems and fire investigation. Design projects have included the redesign of an electro-hydraulic, variable position hospital bed for burn victims; medical implants (spine rod, heart valve, aorta insert, pacemaker, hip, knee and fatigue design); the design of a powered wheelchair that provides standing and sitting positions; the analysis and redesign of high temperature/high pressure piping and pressure vessels; the design of fire safe storage vaults for electronic media; dynamic damping devices for tall structures and bridges subject to wind and earthquake loading; the redesign of pistons and valves for high pressure hydrogen compressors; and, electronic sensors for structural health monitoring.

Fire investigation, electrical, and combustion analysis cases have included the evaluation of over 200 home fires; dozens of propane and natural gas fired equipment fires, including barbecues, heaters, furnaces and cooking appliances; refinery, chemical plant, power plant and coal processing plant fires and explosions; and the evaluation of fuel containers, including propane tanks, charcoal lighter fluid cans, and gasoline containers from 1 gallon consumer containers to tanks containing thousands of gallons. More than 200 gasoline fire and explosion tests have been conducted at BEAR as well as hundreds of magnetic field, electric field and spark tests. Design projects have included the design and evaluation of hydrocarbon handling equipment (towers, tanks, pumps, compressors, piping, valves, heat exchangers and furnaces), burner and flow modeling, leak detection methods for tanks, flame arrestors for storage, relief and vapor recovery systems, and burn/spark/fire resistant cauterizing forceps for surgery.

8/90 - 1/91, Mechanical Engineering Instructor, U.C. Berkeley

Instructor for the Department's senior design course: ME-102B, "Mechanical Engineering Design". Conducted lectures on the design of bolted joints, springs, gears, bearings, chain drives, wire ropes, and other mechanical components. Guided students through a major design project.

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3/82 - 1/89, Engineering Mechanics Specialist, Chevron Corporation

Handled highly technical projects and provided technical consultation to field engineers in the areas of failure analysis and design. Projects included the redesign of compressor and turbine components, and the design of processing equipment for service temperatures above 1400 degrees Fahrenheit. Consultation varied from giving design advice on how to avoid structural vibration to calculating crack growth rates for offshore platforms in the North Sea.

9/81-3/82, Project Engineer, Chevron USA Production

Responsibilities included the design, and construction management of oil/water separation plants and gas recovery plants in the Bakersfield and Colinga oil fields.

Patents

"Thermo-electric Container for Heating and Cooling Liquids," G.R. Stevick and H. Sherback.

"Method and Apparatus for Dynamic Space-Time Imaging System," G.R. Stevick, J. Singer, and D. Rondinone.

"Method and Apparatus for Magnetic Response Imaging," Jerome R. Singer, Glen Stevick, David Rondinone, John Zalabak.

Publications and Selected Reports

Stevick, Glen, Joseph Zicherman, David Rondinone, and Allan Sagle. "Failure Analysis and Prevention of Fires and Explosions with Plastic Gasoline Containers." *Journal of Failure Analysis and Prevention* 11.5 (2011): 455-65.

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