CURRICULUM VITAE

BRIAN R. THICKE, BASc., MBA, P. Eng.

ACADEMIC QUALIFICATIONS

1984 Master of Business Administration, University of Alberta

1974 Bachelor of Applied Science, University of British Columbia (Mechanical Engineering)

PROFESSIONAL ASSOCIATIONS

- Member, Association of Professional Engineers, Geologists and Geophysicists of Alberta
- Associate Member, Society of Automotive Engineers
- Member, Canadian Association of Technical Accident Investigators & Reconstructionists (CATAIR)
- Member, National Association of Fire Investigators (NAFI)
- Member, National Fire Protection Association (NFPA)

PROFESSIONAL CAREER

1993 - Present	**Anderson Associates Consulting Engineers Inc.,** Partner
1990 - 1993	**Babcock & Wilcox,** Regional Manager
1987 - 1990	**Alberta Power Ltd.**, Plant Engineer/Lead Engineer
1984 - 1987	**Anderson Associates Consulting Engineers Inc.,** Mechanical Engineer
1983 - 1984	**University of Alberta,** Research Assistant (while obtaining MBA degree).
1980 - 1983	**Monenco Consultants,** Senior Mechanical Engineer
1974 - 1980	**Atomic Energy of Canada Ltd.,** Junior Design Engineer/Resident Engineer

CAREER HIGHLIGHTS

Broad experience in design, commissioning, operation and maintenance of industrial plants.
Co-inventor of several patented tools and processes.
Special expertise in analysis of plant/equipment upset and failures.
Qualified as an expert witness in all levels of court in Alberta. Also qualified in British Columbia Supreme Court, NWT Territorial Court, and Saskatchewan Court of Queen's Bench.

AREAS OF EXPERTISE

Machine Design

Designed or worked with a team of designers providing the detailed mechanical design of the following equipment:

- Candu nuclear reactor control rods and control rod mechanisms including gears, bearings, brakes, clutches, shafts, couplings, speed reducers, mechanical seals, cables, sheaves, springs, electric motors
- Earthquake and stress analysis of various components of Candu nuclear reactors
- Computer simulation and laboratory testing of nuclear reactor components' mechanical operation
- Heat transfer calculations for auxiliary plant equipment and control rods
- Stress analysis of wellhead equipment
- Down hole heavy oil pump including sliding seals, wipers, ball valves, seats, plunger and pump barrel
- Chrome plating facility including structural components, counter weight, copper bus bars, electrical insulation 10,000 amp brushes, chain drive, stepper motor, mechanical coupling and emergency brake
- Replacement of vibrating hopper in coal reclaim system
- High temperature flue gas filter bag using a Ryton scrim and Nomex or P-84 felt media
- Torque meter using strain gages
- Weld backup ring for production pipeline installation tool including air cylinders, rotary cam, cam followers, copper shoes, springs, bushings, and retainers
- Centrifuge design concept and prototype design
- Coal bed fracturing tool incorporating a pop valve with hydraulic and mechanically delayed closing mechanism
- Oil field production enhancement tool using a water injection pulse engine operated hydraulically or by a large solenoid
- Environmental cleanup tools for injecting chemicals into contaminated ground.

Patent Analysis

Patents have been reviewed to provide a basis for design for industrial clients and an understanding of the claims for legal clients in the following areas:

- Seismic bore hole plugs
- Zero till seeding equipment

- Weld backup rings and actuators
- Pipeline bending shoes
- Tubing anchors for production tubing
- Automatic spray coating applicators
- Downhole drill pipe stabilizers
- Fabric filter bags
- Pulse injection of fluids
- H_2S dissociation methods
- Aeration system
- Downhole bearing assembly
- Water cooler nozzle

Plant Damage

Mechanical equipment such as the following have been analyzed:

- Boiler corrosion, wear, flame impingement, water carry over
- Brush gear to determine cause of flashover
- Switch gear failure
- Car ramp failure
- Chillers and refrigeration units
- Coal handling equipment
- Control valve sizing problems
- Coal screen causing excessive building vibrations
- Dehydrating units, compressors and generator packages
- Dryer degradation
- Engines to determine the cause of failure
- Gear boxes to assess reason for shaft failure
- HVAC equipment to determine cause of equipment freeze up
- Large crane and man lift tipovers
- Mountain bike assembly problems
- Piping system problems
- Pump performance issues
- Pumps to determine reason for frequent maintenance
- Reformer refractory dome design faults
- Sprinkler system to determine adequacy
- Transmissions to investigate assembly problems
- Turbine blade failures
- Valves to resolve noise, vibration, other operating problems

Structural components such as the following have been analyzed:

- Building cladding
- Concrete slabs and basement walls of cinder block and concrete
- Steel and wood structures

Industrial Plant Upsets

Experience in the design, construction, commissioning, operation, and maintenance of large industrial plants allows a thorough analysis of plant upsets that have led to large insurance claims for lost production. Typically upstream and downstream equipment operating and maintenance records must be checked out and referenced to the original equipment design criteria. Analysis of the detailed design of each part of an integrated plant permits an understanding of how an upset affects the performance of the whole plant.

Evaluation of a petrochemical plant upset required simultaneous analysis of the following components to determine dependencies of the integrated process:

- moving bed catalytic reactor components that experienced plugging
- pressure and flow data from a compressor
- outlet screws of a chloride treater
- reactivation cycling of desiccant dryer and life of desiccant
- gas filter damage and design changes
- package boiler super heater water carryover damage from steam drum water separators
- cold box performance deterioration and freeze up

Evaluation of an acid plant upset required simultaneous analysis of the following components to determine the cause of a series of outages:

- wet precipitators to determine humidity of gas
- acid dryer internal components and design
- packing and demister performance
- operating temperatures in a series of shell and tube heat exchangers
- maintenance and operating histories of plant equipment

Fires and Explosions

Cause and origin analyses of fires and explosions has included investigation of small residential fires and explosions, vehicle fires, commercial property fires, forest fires, and plant explosions. Work on large industrial fires/explosions has been carried out on a used oil recycling plant, environmental disposal facility, natural gas liquids plant, propane bottling depot, oil field batteries, sulfur plant, gas plants, heavy oil upgraders, compressor stations, coal handling equipment and generators. Specific work performed typically includes some or all of the following:

- Detailed examination and documentation of the scene to determine the origin of the fire/ explosion and the extent of damage.
- Review of plant drawings, and operating and maintenance records to determine the cause of the fire or explosion.
- Evaluation of the requirement to replace or repair damaged equipment and concrete surfaces.
- Determination of the scope of repair work and delineation of plant betterment included in the repairs.
- Provision of repair or replacement procedures when necessary.

- Monitoring of the repair contractor's cost and schedule including review of invoices.
- Evaluation of replacement cost for the purposes of coinsurance analysis.

Motor Vehicle Accident Reconstruction

Work includes analysis of impact speeds, pre and post impact movements, seat belt effectiveness, visibility, potential to avoid, mechanical failures, and defects. Analysis is based on physical information available from personal inspection or from documented data or witness's statements. Computer simulations, video reenactments, animations, photogrammetry, computerized calculations, microscopic examinations, accident scene diagrams, and library resources are used to analyze the available information and provide opinions relating to the cause of the MVA. The following is a list of typical types of MVA investigations and analysis performed:

- Highway collisions where vehicles collide at high speed either in a head-on or intersection related impact.
- Single vehicle accidents involving loss of control, vehicle roll over, or impact with roadside objects.
- Low speed impacts typical of those rear-end collisions and side-swipes occurring on city streets and in parking lots.
- Motor vehicles including large trucks striking pedestrian and bicycle.
- Motorcycle accidents with trucks, passenger vehicles and other motorcycles.
- Heavy vehicle collisions involving loaded tankers, semi trailers, B-trains, busses, road maintenance equipment and the like.
- Non-standard vehicles such as dirt bikes, quads, trikes, wheelchairs, scooters, farm equipment, oil field equipment, trains, and snowmobiles colliding with other vehicles or with each other.

Personal Injury Investigations

There are numerous situations where engineering principles have been used to analyze the facts around a personal injury claim. Some of the more common situations that have been investigated include:

- Slip and fall type accidents occurring on ramps, stairs and sidewalks. The effects of surface finish and unevenness have been analyzed to determine compliance with standards and likely cause of the mishap.
- Swimming pool accidents have been analyzed to determine the sight lines of guards, location of mishap, drainage of deck area.
- Interactions with equipment (ladders, farm equipment, pumps, lifts, safety guards, wheelchairs) that cause injury.
- Injury associated recreational equipment such as toboggans, inner tubes, boats, mountain bikes, weight lifting equipment and gymnastics equipment.
- Workplace incidents where employees have been injured due to equipment design/ malfunction or simply not following standard procedures.

Process Design

- Field modifications of piping inside a Candu nuclear reactor building
- Pipe hanger design
- Computer simulation of boiler response to transient air and flue gas conditions
- Hot water heating, fire protection, potable water, steam piping systems detailed design
- Coal handling, ash handling, air, flue gas systems for power generation
- Plant improvement projects including material handling, dust filtration, boiler upgrading, settling pond improvements, asbestos removal, and office building upgrades

Instrumentation

- Programming of microprocessors for process control in Basic, Forth, and Assembler code
- Research and development of oil/water cut analyzer including mass flow meter

Construction

- Supervision of correct installation of process equipment and piping in Candu nuclear reactor building
- Supervision of various utility plant improvement projects including coal plant equipment installation, boiler upgrades, coal mill installation, ash plant equipment modifications, cooling tower installation, and electrostatic precipitator demolition
- Provision of contract maintenance services primarily in power stations and pulp mills in Alberta and British Columbia using unionized trades

Field Testing

- Commissioning assistance during the startup of the Bruce nuclear power station control rod mechanisms including flow proving to each of the booster rods using the moderator pump pony motor.
- Testing of concrete expansion anchors, including concrete damage from anchor failure, for use with nuclear reactor components.
- Start up testing of the HVAC equipment, fire protection equipment, air operated oil pumps in a coal plant service building.
- Flue gas flow measurement from a large utility boiler using a pitot-static tube with temperature sensing.
- Oil well production monitoring using gas separator and dump valve in conjunction with prototype oil/water cut analyzer.
- Shop testing of down hole tooling (jars and shock subs).
- Testing the performance of utility plant components during operation including boiler, turbines, condensers, water pumps, pneumatic conveying systems, heat exchangers, cooling towers, feed water heaters, fans, HVAC equipment, coal pulverizing and conveying equipment.
- Measurement of carbon monoxide levels in a home as a result of a construction deficiency.

- Statistical evaluation of business survey results.

Contract Administration

- Tender, evaluate, and award contracts for the supply of equipment and services for the conversion of a large gas fired power plant to coal firing
- Tender, evaluate, and award contracts for the supply of equipment and services for plant upgrading projects
- Prepared tenders and executed contracts to provide maintenance services in pulp mills and power plants in Alberta and Saskatchewan

PATENTS ISSUED

US Patent 6119916 Internal Backup Ring System assigned to Proline Pipe Equipment Inc. (Canadian Patent 2251307)

US Patent 6386421 Actuation System for an Internal Backup Ring Assembly assigned to Proline Pipe Equipment Inc. (Canadian Patent 2343285)

US Patent 6877566 Method and Apparatus for Causing Pressure fluctuations in a Wellbore assigned to International Oilfield Consultants (Canadian Patent 2493017)

US Patent 7455828 Process and Apparatus for Converting Hydrogen Sulfide to Hydrogen and Sulfur assigned to H_2S Technologies Inc. (Canadian Patent 2598094)

US Patent 7721583 Pipe Bending Shoe assigned to Proline Pipe Equipment Inc. (Canadian Patent 2665575)

COURSES AND CONFERENCES

- International Symposium on Fire Investigation Science and Technology, 2010
- EPIC Seminar – Failures, Failure Prevention … .With Life Extension Considerations
- Estimating Driver Response Times (Drive 3) 2004
- Canadian National Advanced Fire, Arson and Explosion Investigation Training Program, 2001
- Heavy Vehicle Rollover Toptec, 2000
- Accident Reconstruction: State-of-the-Art Toptec, 1999
- SAE Conference 1999
- Chemical Engineering Fundamentals For Non Chemical Engineers 1998
- PC Crash and PC Rect Training Workshop - 1998
- CE650 Advanced Topics in Photogrammetry - 1997
- Alberta Airbrake Driver Training - 1995

- Accident Reconstruction in Serious Motor Vehicle Personal Injury Claims - 1995
- Concept of Night Visibility - 1995
- Accident Reconstruction Seminars - EDC Reconstruction - 1994
- Independent Studies, Northwestern University - Traffic Institute - 1994

PRESENTATIONS

2004 - "Two Highway Head-On Collisions" to the Canadian Institute
2002 - "Motor Vehicle Accident Expert Report/Evaluation" to the Canadian Institute
1997 - "The Role of the Expert Witness" to the Association of Professional Engineers, Geologists and Geophysicists of Alberta
1997 - "MVA Investigations" to The Alberta Ambulance Association
1995 - "Low Speed Collisions", Leonard Hirst & Miller Client Seminar
1990 - "Ten Years of Pulse Jet Baghouse Experience at the H. R. Milner Station" to EPRI Conference

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Brian R. Thicke, P. Eng. Date