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June 5th, 2019

30 Forensic Engineering

Re: Transportation Engineer
Dear Hiring Manager,

I am writing with regard to the transportation engineering job opening at 30 Forensic Engineering. I believe that I have the communication skills, technical know-how and education needed for this position.

My master's thesis at the University of Toronto involves the design and fabrication of high temperature piezoelectric ultrasonic transducers for process management and control. During my thesis I have learnt about ultrasonic transducer design, digital signal processing and coordinating research and development activities with industrial partners. Designing transducer casings, brazing jigs for transducer components and projects in undergrad such as designing a mechanical actuator have helped me understand CAD design, 3-D printing, machining, tolerances and manufacturing. Working on my thesis as well as working as a research assistant in undergrad have helped me develop important research skills. It has taught me well as how to work in a fast-paced research environment and how time management and communication between team members is crucial to the team's success. During my time as a research assistant in undergrad I designed a device to coat one powder onto another (dry coating) and it is patentable. I am highly motivated and able to work independently. Reasons such as these lead me to believe that I would be a very efficient and involved employee of 30 Forensic Engineering if given the stellar opportunity.

As a Mechanical Engineering student, I am very interested in transport, examination and analysis. Working for 30 Forensic Engineering would only stimulate my interest in engineering even more.

I hope that my education and experience are a good fit for the position. I can be contacted at (613)890-8673 and welcome an interview at your convenience. Enclosed is my C.V. Thank you for your time.

Best regards,
Neelesh Bhadwal
M.A.Sc Student, E.I.T
UNDEL (Ultrasonic Nondestructive Evaluation Laboratory)
University of Toronto

EDUCATION

Master of Applied Science, Mechanical Engineering September 2017-In Progress

University of Toronto, Toronto, Ontario

- **3.68**/4.00 CGPA

Awards and scholarships:

- Mechanical and Industrial Engineering Fellowship (valued at $10500 a year)
- Ontario Centres of Excellence's (OCE's) TalentEdge Internship Program (valued at $20000)

Thesis Topic: Development of High Temperature Ultrasonic Transducers for Process Measurement and Control. Supervised by Dr. Anthony Sinclair and Dr. Tom Coyle.

Publications:

- C. Bosyj, N. Bhadwal, T.W Coyle, A. Sinclair, ”Brazing strategies for high temperature ultrasonic transducers based on $LiNbO_3$ piezoelectric elements”, submitted to Sensors, 10 October 2018.
- N. Bhadwal, C. Bosyj, M.H Amini, T.W Coyle, A. Sinclair, “Development of High-Temperature Ultrasonic Transducers for Process Measurement and Control”, presented a poster at the Canadian Institute for Non-destructive Evaluation (CINDE) in Halifax, 2018 as well as at the Mechanical and Industrial Engineering Graduate Research Symposium at the University of Toronto, 2018.

Bachelor of Engineering, Mechanical Engineering September 2013-April 2017

Carleton University, Ottawa, Ontario

- **10.20**/12 CGPA, Letter Grade: **A**-

Awards and scholarships:

- 2x Natural Sciences and Engineering Research Council of Canada- **Undergraduate Student Research Award** (NSREC-USRA)
- Clarence C. Gibson Scholarship (valued at $2000)
- J. Lorne Gray Scholarship (valued at $2000)
- 2x Dean’s Honour List

Publications:

- G. McRae, O. Basu, N. Bhadwal, A.F. Mackintosh, and G. Veilleux, “Waterproof torrefied wood pellets for combustion”, was presented (oral) at the Canada-Korea Conference on Science and Technology (CKC) in Montreal, 2017.

Citizenship: Canadian
Availability: September 2019

SKILLS & EXPERIENCES

Technical Skills

My thesis involves the following:

- Design, fabrication and assembly of ultrasonic components and transducers for operation at temperatures up to 800^{o}C on industrial pipes and vessels.
- Study of coupling mechanisms for transducer components capable of withstanding extreme temperatures.
- Manufacturing of ceramic acoustic backings and machining alignment jigs for brazing transducer components.
- Designing and machining metallic casings using CAD (Solidworks) and Finite Element Analysis (Comsol) to house the core of the ultrasonic transducer.
- Digital Signal Processing using Matlab of the signal received by the ultrasonic transducer in order to study the power spectrum, signal to noise ratio and amplitude of the signal.
- Finite Element Modeling of different transducer components subjected to compressive loading.
- Operating an open-air furnace at up to temperature of 1500^{o}C for sintering and a vacuum furnace up to 900^{o}C for brazing.
- Finding the optimal pressure required to attach the ultrasonic transducer to a pipe using a load frame. Alignment of transducer components and compression platens in the load frame is crucial for not damaging the piezoelectric crystal at the core of the transducer. Self aligning compression platens are being designed.
- I took the courses Digital Signal Processing, Finite Element Method and Advanced Mechatronics in graduate school.

I am also proficient in the use of several computing languages such as Java, C++, HTML, MS Excel and MySQL (Database Management System).

Communication & Team Skills

- Clearly presented different findings of research to undergraduate, graduate students, professors and industrial partners working in similar research fields multiple times.
- Took the course “Engineering Presentations” in graduate school to further sharpen communication skills. The course required public speaking every class and a letter grade of A was received.
- Wrote multiple technical memos and technical notes on the procedures used in the research work being conducted.
- Worked in a team of three to five research assistants and together the team coordinated resources which enabled team members to achieve their individual and team deliverables.
- Effectively wrote emails, agendas, proposals and minutes for team projects.
- Summarized rules and regulations such as ASTM standards and presented the relevant applicable highlights to the research group.

WORK EXPERIENCE **Research Assistant (NSERC-USRA)**

Biofuel Project- Supervised by Dr. Glenn McRae and Dr. Onita Basu, Carleton University, Ottawa

May-August 2016

- Worked on the use biofuel (hydrophobic) as a binder for making hydrophilic pellets hydrophobic. Designed a device to coat biofuel to the hydrophilic material.
- Successful hydrophobic pellets were made for an industrial client.
- The method I designed to coat the biofuel onto other biomass pellets to create a hydrophobic coating is **patentable**.

May-August 2015

- Worked on using biofuel as a green binder for coal fines to make durable pellets.
- The effects of temperature on pelletization and the glass transition of polymers were studied.
- An MTS 810 was used to generate pressure for pelletization and SEM images were taken to understand the differences in the pellets. The strength and durability of the different pellets was measured using an Instron 5582 load frame and a durability tester
- Further research was continued into the fall semester under the course MAAE 4917 (Undergraduate Directed Study). A satisfactory pellet was formed at the end of the term.

May-August 2014

- To connect two autoclaves together such that fluid could flow through them, individually designed a piping system that could take high pressure and temperature. Summarised the design and the expected failure method of the system (in case of over- pressurisation) in a written technical report.
- Designed and machined a die able to withstand more than 30 000 psi of pressure to form biofuel pellets.

APPLIED CLASS PROJECTS

Pool Pong **September-December 2015**

- Working in a team of five a device was designed to remove ping pong balls from a plastic children's pool. The pool contained 40 ping-pong balls and 12 tennis balls (no water). The tennis balls were to be left in the pool and 20 balls were to be removed for full marks
- Using a shop blower and a custom made wooden stand 39 balls were removed in a minute.

Mechanical Actuator **January-April 2015**

- A mechanical actuator that pulled a cable 1.5" with average pull force of 20 lbf for 3 seconds was designed in a group of three.
- The design incorporated the use of gears and threaded bolts. The gear ratios and number of threads on the bolt were picked to meet the above requirements. A small-scale model was 3D printed and presented to the teaching assistant.

Mars One **September-December 2014**

- Worked in a team of four to help Carleton alumni Andrew Rader (shortlisted to go to Mars) with his research on recreational facilities on Mars and on how to remain physically fit.
- The team suggested the use of lighter equipment such as resistance bands. Each team member's findings were compiled into a final presentation and a report submitted to Andrew.