COVER SHEET FOR GRANT PROPOSALS

State Board of Education

SBOE PROPOSAL NUMBER: (to be assigned by SBOE)	AMOUNT REQUESTED: $45,177
TITLE OF PROPOSED PROJECT: Ultrafast Fermentation	
SPECIFIC PROJECT FOCUS: Build a pilot scale ethanol demonstration plant and an automated biocatalyst maker	
PROJECT START DATE: August15, 2012	PROJECT END DATE: February 15, 2013
NAME OF INSTITUTION: University of Idaho	DEPARTMENT: Biological and Agricultural Engineering
ADDRESS: 4th Floor, Engineering Physics Building, 691 S. Ash St., University of Idaho, Moscow, ID 83843	

	E-MAIL ADDRESS:	PI PHONE NUMBER:
	jonvg@uidaho.edu	208-885-7891

	NAME:	TITLE:	SIGNATURE:
PROJECT DIRECTOR	Jon Van Gerpen	Professor and Head of Department	Jon Van Gerpen
CO-PRINCIPAL INVESTIGATOR			
CO-PRINCIPAL INVESTIGATOR			
CO-PRINCIPAL INVESTIGATOR			

	NAME:	SIGNATURE:
Authorized Organizational Representative	John K. McIver Vice President for Research University of Idaho	John K. McIver

SUMMARY PROPOSAL BUDGET

Name of Institution: University of Idaho

Name of Project Director: Jon Van Gerpen

A. FACULTY AND STAFF

Name/ Title	Rate of Pay	No. of Months CAL	ACA	SUM	Dollar Amount Requested
Jon Van Gerpen, PI (2%)	$135,337				$1,353
% OF TOTAL BUDGET: 2.99%				SUBTOTAL:	$1,353

B. VISITING PROFESSORS

Name/ Title	Rate of Pay	No. of Months CAL	ACA	SUM	Dollar Amount Requested
% OF TOTAL BUDGET:				SUBTOTAL:	

C. POST DOCTORAL ASSOCIATES / OTHER PROFESSIONALS

Name/ Title	Rate of Pay	No. of Months CAL	ACA	SUM	Dollar Amount Requested
Tushar Jain		6			22000
% OF TOTAL BUDGET: 48.7%				SUBTOTAL:	22000

D. GRADUATE / UNDERGRADUATE STUDENTS

Name/ Title	Rate of Pay	No. of Months CAL	ACA	SUM	Dollar Amount Requested
% OF TOTAL BUDGET:				SUBTOTAL:	

E. FRINGE BENEFITS

Rate of Pay (%)	Salary Base	Dollar Amount Requested
41	22000	9020
29.85	135,337	404
	SUBTOTAL:	9424

F. EQUIPMENT: (List each item with a cost in excess of $1000.00.)

Item/Description	Dollar Amount Requested
Peristaltic Pump for Bead Maker (Supplier: Cole Parmer EW-75800-63)	4500
SUBTOTAL:	4500

G. TRAVEL:

Dates of Travel (from/to)	No. of Persons	Total Days	Transportation	Lodging	Per Diem	Dollar Amount Requested
					SUBTOTAL:	

H. Participant Support Costs:	Dollar Amount Requested
1. Stipends	
2. Travel (other than listed in section G)	
3. Subsistence	
4. Other	
SUBTOTAL:	

I. Other Direct Costs:	Dollar Amount Requested

1. Materials and Supplies	7900
2. Publication Costs/Page Charges	
3. Consultant Services (Include Travel Expenses)	
4. Computer Services	
5. Subcontracts	
6. Other (specify nature & breakdown if over $1000)	
SUBTOTAL:	
J. Total Costs: (Add subtotals, sections A through I) TOTAL:	45,177
K. Amount Requested: TOTAL:	45,177

Project Director's Signature: Jon Van Gerpen	Date: 5/10/12

INSTITUTIONAL AND OTHER SECTOR SUPPORT
(add additional pages as necessary)

A. INSTITUTIONAL / OTHER SECTOR DOLLARS

Source / Description	Amount

B. FACULTY / STAFF POSITIONS

Description

C. CAPITAL EQUIPMENT

Description

D. FACILITIES & INSTRUMENTATION

Description

1. Name of Idaho public institution: University of Idaho

2. Name of faculty member directing project: Jon Van Gerpen

3. Indicate if this technology been proposed and/or been awarded an Incubation Fund Award in the past: No

4. <u>Executive Summary:</u> Fermentation is a process in which yeast is used to convert sugars to ethyl alcohol for the fuel and alcoholic beverage industries. The fermentation process usually takes 3-7 days to reach completion. Newly developed biocatalyst beads significantly accelerate the fermentation process and produce ethanol six to nine times faster than current fermentation procedures. These biocatalyst beads are a product created at the University of Idaho and are the subject of a patent application that has been submitted through the University's Office of Technology Transfer. Utilization of the biocatalyst beads technology has the potential to revolutionize the ethanol and alcoholic beverage industry as they reduce the time required for fermentation while overcoming various difficulties of fermentation. These difficulties include, for example, excessive foam formation, yeast recovery and reuse, and mutation of yeast strains. Three companies (Allard Research, e-Fueler, and Summit Natural Energy) have shown interest in incorporating the biocatalyst beads technology into their fuel production equipment and processes. Several tests have also been conducted with local breweries, which have shown good results for commercial use of the biocatalyst beads in that industry. The next step in the commercialization of this technology is to design and build a pilot demonstration plant that uses the biocatalyst beads to produce ethanol and an automated machine that will produce biocatalyst beads in commercial quantities.

5. <u>"Gap" Project Objective and Total Amount Requested</u> : The "Gap" project objectives are to design and build a pilot scale demonstration plant for the use of biocatalyst beads (Fig 1) and to fabricate an automated commercial-scale biocatalyst bead maker (Fig 2). Successful completion of these objectives will provide the know-how to market and produce biocatalyst beads at commercial scale.

Total Amount Requested: $ 45,177

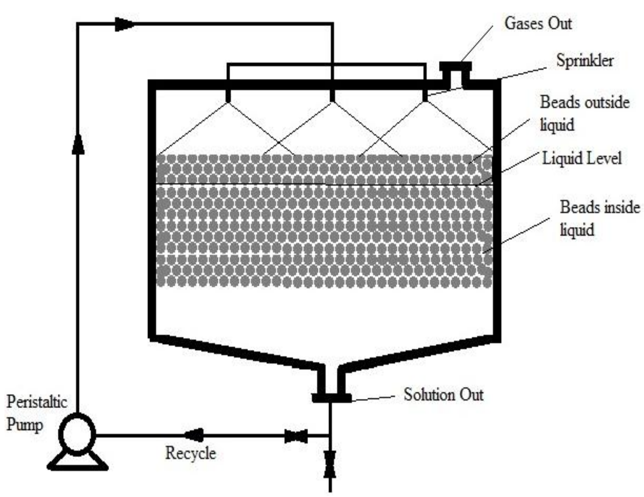

Figure 1: Flow sheet of biocatalyst beads fermenter

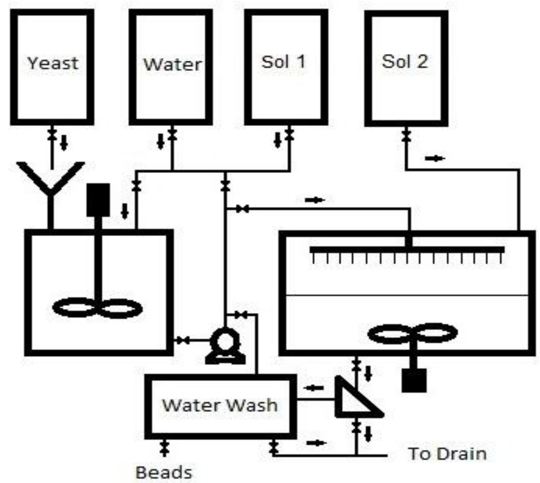

Figure 2: Flow sheet of automated biocatalyst beads maker

6. Description of how resource commitments reflect the priorities of the home institution(s)

The University of Idaho has a long history of research in the field of biofuels. The university is a pioneer in biodiesel research and is committed to expanding its scope into ethanol production research. These biofuels offer the potential for utilizing agricultural crops as domestic energy sources and thus enhancing farm income as well as the nation's energy security. These are major priorities of the University of Idaho's College of Agriculture and Life Sciences.

7. Evidence that the project will have a potential impact to the economy of Idaho

There are several fuel ethanol producers in Idaho and a much larger number of alcoholic beverage producers. The use of biocatalyst beads will increase their production capacities 3-10 times with minimal additional investment and increase their revenues and profit. The biocatalyst beads created and produced in Idaho will be exported to fuel ethanol and alcoholic beverage producers in the United States and later internationally. This will create jobs in Idaho and positively impact the state's economy.

8. Establishes partnerships with the public or private sector or contribute to new company creation.

The project will support the creation of a new Idaho company for producing biocatalyst beads and ultrafast fermenters and will establish partnerships with the public and private sectors. Technology developed at the University of Idaho will be licensed to an Idaho-based company to produce a product (biocatalyst beads) that will be sold to other Idaho companies as well as companies across the United States.

9. <u>The Market Opportunity</u>

a. Need the project would address: The biocatalyst beads technology consists of live yeast microorganisms that are encapsulated within a spherical porous polymer membrane. These beads can be dried and stored until needed. After reconstituting with water, the beads can be added to sugar solutions in high concentrations to accomplish the conversion of sugar to ethanol in a very short time period. When ethanol conversion is complete, the beads can be easily separated from the fermentation broth and re-used in subsequent processes.

Currently, the fuel ethanol and alcoholic beverage industries use a 3-7 day fermentation process. These industries use approximately 1% yeast by weight produced. It is well known that higher yeast concentrations can accelerate fermentation but the cost of the yeast makes this uneconomical. These conventional processes do not allow yeast recycling and many problems arise from high yeast levels. The use of the newly developed biocatalyst beads technology allows much higher yeast concentrations to be economically and effectively used and thus significantly reduces the fermentation time to around 3-7 hours. Microbreweries lose approximately 5% of the beer for each batch when they separate yeast from beer. The use of biocatalyst beads technology eliminates this 5% loss as the biocatalyst beads can be easily separated from the beer with a screen. Also, biocatalyst beads restrict yeast reproduction and hence the yeast mutates more slowly so it can be used at least 12-15 times without any change in beer taste.

b. Applications and markets for the technology: Biocatalyst beads can be used by a variety of industries including the fuel ethanol industries, ethanol equipment manufacturers, microbreweries, wineries and distilled spirits producers. The technology is most applicable to ethanol producers that utilize sugar as the feed stock. It is not currently applicable to the corn ethanol industry because the biocatalyst beads cannot easily be separated from the corn mash. Although an approach to extending the technology to corn ethanol production is being tested, the current market includes waste sugar ethanol producers and the alcoholic beverage industry. According to the Renewable Fuels Association, the “waste” ethanol industry in the United States produces approximately 18 mgy (million gallons of ethanol per year) from sugar and biomass wastes. The beer brewing industry, specifically craft brewers, has approximately 1,940 craft brewers in the US. They produced approximately 355 million gallons of beer in 2011.

c. The product: Biocatalyst beads are made of concentrated yeast cells confined in a semi-permeable membrane (Fig 3). It can be used for accelerated production of ethyl alcohol and is easily recoverable for reuse. It can be reused for more than 50 batches of ethanol production.

Figure 3: Biocatalyst beads

Potential market audience: The market consists of ethanol plants, ethanol equipment manufacturers, beer brewers, wineries and distilled spirits industries. The sugar waste ethanol producers will be an immediate market due to the engineering capability to integrate biocatalyst beads into their process with very little downtime and with no changes to their process. The beer brewing industry, specifically craft brewers, has approximately 1,940 craft brewers in the US. They produced approximately 355 million gallons of beer in 2011. Another target market in the brewing industry is the home-brewing industry. Homebrew beer magazine reports that approximately 13.8 million gallons are brewed at home by home-brewers every year.

The competition: Yeast encapsulation was discovered in the 1980s, but was not optimized to accelerate the fermentation process until 2012. Currently, there is only one company, Scott Laboratories, who is encapsulating yeast using the a similar technology. Scott Laboratories produces encapsulated yeast in alginate beads containing *Saccharomyces* or *Schizosaccharomyces* yeast cells. They have four encapsulated yeast products; each of which has a unique winemaking application. (http://www.scottlab.com). Scott has defined a high-priced, boutique market niche that is based on specific yeast strains, not high volume ethanol production. Their specific bead design does not take advantage of the unique advantages that the technology can provide.

Barrier to market entry: There is little expected competition from the above mentioned Scott Laboratories. Their process of making biocatalyst beads is based on previous technologies of encapsulation which does not allow them to make concentrated biocatalyst beads and hence their beads are not capable of accelerating the fermentation rates. Although they have the infrastructure to produce biocatalyst beads, they need to obtain a license for making concentrated biocatalyst beads, as this new process of making concentrated biocatalyst beads is patent pending from University of Idaho's Office of Technology Transfer. This makes biocatalyst beads the only product in the ultrafast fermentation category. The other barrier to the market entry is that there is very little awareness about biocatalyst beads.

10. <u>The Technology</u>

a. The technology and the current state: The technology to encapsulate a high concentration of yeast cells in a semi-permeable membrane was developed at the University of Idaho. The membrane allows the sugar solution to permeate into the yeast cells while restricting yeast flow outwards. The beads formed by using this technology are called biocatalyst beads. The cost of converting yeast cells to biocatalyst beads is approximately $0.10 per pound of yeast. The biocatalyst beads technology has been developed and tested at the bench scale level. We consider the Technology Readiness Level (TRL) to be 4 at this stage. With GAP funding we will go from TRL 4 to TRL 6 and interested companies will be able to inspect a pilot scale demonstration plant utilizing biocatalyst beads for commercialization of this technology.

b. Contribution to the product and market need and its intellectual property status: The biocatalyst beads are produced by encapsulating a high concentration of yeast cells in a semi-permeable membrane which can be dried, packed and stored. Dried biocatalyst beads have an excellent shelf life. Ethanol producers can utilize these beads after rehydrating them in water.

The technology to make biocatalyst beads is patent pending. The University of Idaho has filed a provisional patent for technology relating to "concentrated biocatalyst encapsulation".

c. Technology developed by: Tushar Jain, Carlo Munoz, Jon Van Gerpen and Joe Thompson with no external funding.

11. <u>Commercialization Partners:</u> Currently, two waste sugar to ethanol equipment manufacturers (E Fuel Corporation and Allard Energy) have signed Non Disclosure Agreements with the University of Idaho and will be visiting the university soon. Other interested companies include are Parallel Products [(sugar waste) – Louisville, KY], Summit Natural Energy [(soda waste) - Cornelius, OR], BP Biofuels North America [(sugar waste, bagasse) – Jennings, LA], Paradise Creek Brewery (Pullman, WA), Palouse Falls Brewer (Pullman, WA) and Moscow Brewing (Moscow, ID)

Future Activities: To generate interest from more companies in biocatalyst beads we are making contacts by participating in business workshops, university and state level business plan competitions and ethanol conventions. Also, we are working with local breweries and talking to University alumni who are involved in the ethanol business. University of Idaho alumnus Paul Mann visited the university and has shown great interest in helping to develop the technology. He was the plant manager for the Simplot ethanol plant in Caldwell, ID and is currently developing an ethanol production project using an agricultural waste product as the sugar source. His *letter of interest* is provided in the Appendix.

After completion of the project, we will be in a position to produce biocatalyst beads at a commercial scale and will have some clients for biocatalyst beads. We will create a limited liability company and after receiving appropriate licenses from the University of Idaho, we will start contracts with the companies.

12. <u>Specific Project Plan and Detailed Use of Funds</u>: Project director Jon Van Gerpen will manage the project and will oversee the financial aspects. Post doctoral fellow Tushar Jain will design and commission the pilot plant and an automated bead maker with the help of research support scientist Joseph C. Thompson. Jain and Thompson will demonstrate the pilot plant to various companies visiting the university.

Table 1: Budget

Resource Description	Requested budget ($)
Post Doctoral (six months)	22,000
Faculty (PI) (2%)	1,353
Fringe Benefits (Post-doc)	9,020
Fringe Benefits (faculty, 31%)	404
Capital equipment and Material (refer Table 2 for details)	12,400
TOTAL ($)	**45,177**

Table 2: Equipment and Materials cost

Sr.	**Description**	**Quantity**	**Total Amount**	**Supplier**
1.	80 Gallons Plastic Tank for Fermenter	1	$ 300	US Plastics
2.	Tanks for preparing bead making solutions	2	$400	US Plastics
3.	Mixing Tank with Blender	2	$800	Grainger
4.	Peristaltic Pump for Fermenter (EW-75800-91)	1	$ 900	Cole Parmer
5.	Peristaltic Pump for Bead Maker (EW-75800-63)	1	$ 4500*	Cole Parmer

6.	Temperature Controller (CNI-CB120-K)	1	$ 800	Omega
7.	Heat Exchanger (G3481064)	1	$600	Zoro Tools
9.	Sprinklers for Fermenter, Tubing and Connectors	-	$ 600	Local
10.	Yeast (300 lb)	--	$ 900	Winco
11.	Na Alginate and Calcium Chloride	20 lbs	$ 800	Amazon
12.	Fluid Bed Drying system	1	$900	Hyfoma
13.	Vacuum Packing Machine and accessories	1	$ 900	Hill Grain
		Total	**$12,400**	

*The peristaltic pump provides contamination free operation to handle the high-viscosity, and shear sensitive fluids.

13. <u>Education and Outreach:</u> A postdoctoral researcher (Tushar Jain) will be employed. We are planning to conduct workshops for students by involving the GPSA (Graduate and Professional Student Association) and IPO (International Programs Office) of the University of Idaho and other universities.

14. <u>Institutional and Other Sector Support:</u> The Biological and Agricultural Engineering Department at University of Idaho will be providing a workshop for designing and fabrication and a well equipped laboratory for testing. There is a commercial scale distillation column which can be used in conjunction with a pilot commercial fermenter. Various machines like pumps, blenders and tanks are available. The 100 sq ft refrigerated space can be used to store dried biocatalyst beads.

Appendices:

1. <u>Facilities and Equipment:</u> To design and develop a pilot scale fermenter we have a workshop equipped with all the necessary tools. The biocatalyst beads needed for the pilot fermenter can be produced using the available pumps, blenders and tanks, once the material (yeast and polymer) is procured. The 100 sq ft refrigerated space can be used to store dried biocatalyst beads. The various facilities and equipment available are:

- Workshop
- Laboratory
- Refrigerated storage space
- Pilot distillation column
- Pumps, blenders and tanks
- Drying equipment

2. <u>Biographical Sketching and Individual Support</u>:

Biographical Sketches:

VITA – Jon Van Gerpen

I. PERSONAL DATA

Address: (office) 419 Engineering Physics Bldg. (phone) 208-885-7891
University of Idaho, Moscow, ID 83844
(home) 1858 E. 6th St., Moscow, ID 83843 (phone) 208-883-3768

Professional Registration: Licensed Professional Engineer in Iowa #14066, Idaho #12478, and South Dakota #9231.

II. EDUCATION

Ph.D.	Mechanical Engineering, University of Wisconsin-Madison, 1984
M.S.	Mechanical Engineering, Iowa State University, 1980
B.S.	Mechanical Engineering, Iowa State University, 1978
B.A.	Philosophy, Iowa State University 1978

III. ACADEMIC EXPERIENCE

Department Head and Professor, Department of Biological and Agricultural Engineering, University of Idaho, July 2004-present
Associate Chair for Research and Budget, Department of Mechanical Engineering, Iowa State University, July 2003-June 2004
Interim Chair, Department of Mechanical Engineering, Iowa State University, August 2002 – July 2003
Professor of Mechanical Engineering, Iowa State University, 2000 – 2004
Director of Graduate Education, Department of Mechanical Engineering, Iowa State University, 1998-2002
Associate Professor of Mechanical Engineering, Iowa State University, 1990-2000
Assistant Professor of Mechanical Engineering, Iowa State University, 1984-1990

IV. INDUSTRIAL AND OTHER NON-ACADEMIC EXPERIENCE

John Deere Product Engineering Center, Waterloo, Iowa, Summer 1993
John Deere Product Engineering Center, Waterloo, Iowa, July 1991-August 1992 for Faculty Improvement Leave
NASA Lewis Research Center, Cleveland, Ohio, Summers 1987-1988
John Deere Product Engineering Center, Waterloo, Iowa, Summers 1978 and 1979
John Deere Harvester Works, East Moline, Illinois, Summers 1975 and 1977

V. RECENT TECHNICAL PUBLICATIONS

1. Wall, J., J. Thompson, and J. Van Gerpen, “Soap and Glycerin Removal from Biodiesel Using Waterless Processes,” accepted for publication in the Transactions of the American Society of Agricultural and Biological Engineers, Apr 2010.
2. Wang, P.S., J. Thompson, and J. Van Gerpen, “Minimizing the Cost of Biodiesel Blends for Specified Cloud Points,” Accepted for publication in the Journal of the American Oil Chemists’ Society, Sept. 2010.
3. Wang, P.S., J. Thompson, T.E. Clemente, and J. Van Gerpen, “Improving the Fuel Properties of Soy Biodiesel,” Accepted for publication in the Transactions of the American Society of Agricultural and Biological Engineers, July 2010.
4. Caliskan, H., M.E. Tat, A. Hepbasli, and J.H. Van Gerpen, “Exergy Analysis of Engines Fueled with Biodiesel from High Oleic Soybeans Based on Experimental Data,” Int. J. Exergy. 7(1):20-36. 2010.

5. Graef, G., B. J. LaVallee, P. Tenopir, M. Tat, B. J. Schweiger, A. J. Kinney, J. Van Gerpen and T. E. Clemente, 2009. A high-oleic-acid and low-palmitic acid soybean: Agronomic performance and evaluation as a feedstock for biodiesel. Plant Biotechnology Journal. 7(5):411-421
6. Van Gerpen, J.H., A. Gray, and B.H. Shanks, "Convergence of Agriculture and Energy: III. Considerations in Biodiesel Production," Invited participation to lead development of a CAST Commentary, The Council for Agricultural Science and Technology, Ames, Iowa. Published October 2008.
7. He, B.B., J.H. Van Gerpen and J.C. Thompson, 2009. "Sulfur Content in Selected Oils and Fats and their Corresponding Methyl Esters," Applied Engineering in Agriculture. 25(2):223-226.
8. Shrestha, D.S., J. Van Gerpen, and J. Thompson. 2008. "Effectiveness of Cold Flow Additives on Various Biodiesels, Diesel, and Their Blends," Transactions of the ASABE, 51(4):1365-1370.
9. Pradhan, A., D. Shrestha, J. Van Gerpen, and J. Duffield. 2008. "The Energy Balance of Soybean Oil Biodiesel Production: A Review of Past Studies," Transactions of the ASABE, 51(1):185-194.
10. Tat, M.E., P.S. Wang, J. H. Van Gerpen, and T.E. Clemente, "Exhaust Emissions from Engines Fueled with Biodiesel from High Oleic Soybeans," Journal of the American Oil Chemists' Society, V. 84, No. 9, pp. 865-869, 2007.
11. He, B.B., J.C. Thompson, D.W. Routt, and J. Van Gerpen, "Moisture Absorption in Biodiesel and Its Petro-Diesel Blends," Applied Engineering in Agriculture, V. 23, No. 1, pp. 71-76, 2007.
12. Tat, M. E., J. Van Gerpen, and P.S. Wang, "Fuel Property Effects on Injection Timing, Ignition Timing, and Oxides of Nitrogen Emissions for Biodiesel-fueled Engines", ASABE Transactions, V. 50, No. 4, pp. 1123-1128, 2007. (This paper received an ASABE "Superior Paper" award at the 2008 ASABE Annual meeting, indicating it was one of the top 2.5% of the papers in 2007)
13. Yuan, W., A.C. Hansen, M.E. Tat, J.H. Van Gerpen, and Z. Tan, "Spray, Ignition, and Combustion Modeling of Biodiesel Fuels for Investigating NOx Emissions," ASAE Transactions V. 48, No. 3, pp. 933-939, 2005.
14. Wang, P. S., M. E. Tat, and J. Van Gerpen, "The Production of Isopropyl Esters and Their use in a Diesel Engine", Journal of the American Oil Chemists' Society, V. 82, No. 11, 2005, pp. 845-849.
15. Van Gerpen, J. "Biodiesel Processing and Production", Fuel Processing Technology, V. 86, pp. 1097-1107, 2005.
16. Tat, M. E. and J. H. Van Gerpen, "Speed of Sound and Isentropic Bulk Modulus of Alkyl Monoesters at Elevated Temperatures and Pressures", Journal of the American Oil Chemists' Society, V. 80, No. 12, pp. 1249-1256, 2003.
17. Tat, M. E. and J. H. Van Gerpen, "Effect of Temperature and Pressure on the Speed of Sound and Isentropic Bulk Modules of Mixtures of Biodiesel and Diesel Fuel", Journal of the American Oil Chemists' Society, V. 80, No. 1, 2003, pp. 1127-1130.
18. Tat, M. E. and J. H. Van Gerpen, "Biodiesel Blend Detection Using a Fuel Composition Sensor", Applied Engineering in Agriculture, 19(2): 125-131, 2003.
19. Canakci, M. and J. Van Gerpen, "A Pilot Plant to Produce Biodiesel from High Free Fatty Acid Feedstocks", ASAE Transactions, Vol. 46(4), 2003, pp. 945-954. Also published as ASAE Paper No. 01-6049.
20. Canakci, M. and J. Van Gerpen, "Comparison of Engine Performance and Emissions for Petroleum Diesel Fuel, Yellow Grease Biodiesel, and Soybean Oil Biodiesel", ASAE Transactions, 46(4): 937-944. 2003.
21. Canakci, M. and J. Van Gerpen, "Biodiesel Production from Oils and Fats with High Free Fatty Acids", Transactions of the American Society of Agricultural Engineers, V. 44, No. 6, 2001, pp. 1429-1436.

Tushar Jain

Tushar is a PhD student with Department of Biological and Agricultural Engineering at the University of Idaho studying in his final semester. His research is in Lignocellulosic Ethanol. He holds Master's Degree in Chemical Engineering. Before coming to US in 2008 he worked as design engineer in a biofuel production facility in India. Recently he was part of team for Idaho National Laboratory's project on Lignocellulosic Ethanol. He designed an automated pilot scale reactor which used encapsulated biocatalyst technology to convert lignocellulosic biomass to sugars. He has recently filed patents on "Ultrafast fermentation" and "Bioreactor design".

Contact Information: Room 405, E. P. Building, University of Idaho, Moscow, ID 83843

Phone: 208-596-9208

University of Idaho; PhD Lignocellulosic Ethanol: Department of Biological and Agricultural Engineering;

Expected Graduation Date: May 2012

Joseph C. Thompson

Joseph C. Thompson is Technical Director of WI biofuels and Research Support Scientist in Department of Biological and Agricultural Engineering at the University of Idaho. He has held that position since July 1987. Before that, he was Project Assistant at Catholic Relief Service, Tunisia and Morocco, where he assisted in the implementation of an Agricultural Mechanization Projects. He has been investigating the production and utilization of biodiesel for the past 26 years. He has conducted various workshops on biodiesel production and utilization in US and in Mexico. Joseph C. Thompson holds B.S. degree in Agricultural Engineering from Ohio State University, M.S. in Agricultural Engineering from the University of Idaho and PhD in Industrial Technology from University of Idaho. His recent five publications are:

1. Thompson, J. and B. He. 2004. Chemical and Physical Properties of Crude Glycerol from Biodiesel Production, and Its Purification Methods and Potential Uses. ASAE Paper No: PNW04-1010. ASAE, St. Joseph, Mich.*
2. Singh, A., J. Thompson, and B. He. 2004. Function and Performance of Pre-Reactor in Biodiesel Production from Seed Oils using Reactive Distillation Column. ASAE Paper No: PNW04-1011. ASAE, St. Joseph, Mich.
3. Singh, A., J. Thompson, and B. He. 2004. A Continuous-flow Reactive Distillation Column for Biodiesel Preparation from Seed Oils. ASAE Paper No: 04-6071. ASAE, St. Joseph, Mich.
4. He, B., A. P. Singh, J. C. Thompson. 2004. A Novel Continuous-flow Reactor using Reactive Distillation Technique for Biodiesel Production. Trans. ASAE (submitted. manuscript # FPE-0562-2004).
5. Thompson, J. C., and C. Peterson. 2002. Experiments with Yellow Mustard Biodiesel. Proceedings: The tenth biennial Bioenergy Conference, Bioenergy 2002, Sept 22-26 2002 Boise, ID*

Contact Information: Room 75, James Martin Lab, University of Idaho, Moscow, Idaho 83843

Phone: 208-885-5943

3. Provide documentation of other sector resource commitments.

Letter of Interest

Bio[Fuels & Mass] Consulting
407 E. Spruce St.
Caldwell, Idaho 83605
April 26, 2012

Dr. Jon H. Van Gerpen
Department Head
Department of Biological & Agricultural Engineering
Engineering Physics Building, Room 421
P.O. Box 440904
Moscow, Idaho 83844-0904

Dear Dr. Van Gerpen,

While I was on campus last week to attend the Alumni Advisory Board for the College of Natural Resources, I had the pleasure of meeting Tushar Jain, a graduate student, in the Department of Biological and Agricultural Engineering. We discussed his research for several hours Wednesday and Thursday.

Based on my experience of managing the J.R. Simplot Company's ethanol fuel business unit for 14 years, which consisted of two plants, that utilized waste potatoes, peel, and chips as the primary feedstock for ethanol fermentation and a marketing component, I found Tushar's research concept very interesting for I believe that there is potential to reduce the cost of capital and reduce fermentation times. Reducing fermentation times reduces the potential for infections for either corn-to-ethanol or sugarcane-to-ethanol processing. Tushar's concept involves novel intellectual property, which could alter the processing of ethanol. Also, I feel there is potential application in the processing of advanced biofuel feedstocks particularly in the fermenting of C-5 sugars into ethanol or C-6 sugars into propanol. Today, those fermentations require extended times. With Tushar's concept those fermentation times could be reduced; therefore, increasing the economic viability of those processes.

The ability to process C-5 sugars and to produce butanol in a timely manner would contribute to the national goals of reducing dependency on foreign crude oil, improving the strategic defense, improving the environment through reduced air pollution and water contamination, and creating economic development.

If you have questions, please contact me.

Sincerely,

Paul

Paul T. Mann, Ph.D.