



# STUDENT GREEN ENERGY FUND

## BSF Exhaust Fume Hoods Retrofit



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*Section 1: Summary Information*

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<b>Project Title</b>	BSF Exhaust Fume Hoods Retrofit
<b>Principle Investigator</b>	Arun Kumar Narasimhan
<b>Proposed Starting Date</b>	July 2018
<b>Project duration</b>	8 months
<b>PI Expected graduation date</b>	May 2019
<b>Requested SGEF Funds</b>	\$ 75,993

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*Section 2: Applicant Information*

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<b>Applicant Information:</b>	<b>Full Name</b>	<b>Department</b>	<b>Email Address</b>	<b>Phone</b>
<b>Principal Investigator</b>	Arun Kumar Narasimhan	Chemical & Biomedical Engineering	<a href="mailto:arunkumar@usf.edu">arunkumar@usf.edu</a>	813-451-0612

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*Section 3: Project Information*

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**Project description:**

The fume hoods and the mechanical ventilation systems operate at high constant air flow rates at all times resulting in a very large energy consumption and consequently very large carbon footprint. Per Occupational Safety and Health Administration (OSHA) regulations, the exhaust hoods must exhaust air at a face velocity of 100 feet per minute across the face area of the sash opening. This air must be made up through mechanical ventilation system, where the air is cooled and dehumidified first and then reheated before introducing into the occupied space. In Tampa, this simultaneous heating and cooling of outdoor air and then eventually exhausting it through the exhaust hoods goes on 24x7 and 365 days of the year. The potential to save energy, while complying with the regulatory and user comfort level standards, lies in controlling the air flow

based on demand. This project will address 8 exhaust hoods in two BSF labs 357 and 363. It includes installation of one motion sensor for each exhaust hood, automating the sash closure when there is no motion detected, and installation of a variable flow control and monitoring system to vary the exhaust air quantity based on the sash opening and for thermal comfort needs of the space. The system will comply with the regulatory requirements and user comfort level standards. The 8 fume hoods when retrofitted with the variable air flow controllers will result in about 80% energy savings and a payback of 2.8 years. This project is modeled after a successful demonstration project completed on 2 exhaust hoods in BSF 151 lab. In addition, the project will also include digital screen displays of room condition on the outside of the lab, at the exhaust hood, and a room purge control with push button for a chemical spill inside the room.

### **Project Activities:**

With the funding, the existing fume hoods in the BSF laboratory (357 and 363) will be retrofitted with auto sash controllers, variable flow controllers, monitoring system inside and outside the laboratory. The project implementation will include bidding, designing, acquiring permits, scheduling installation, commissioning, testing and balancing. The expected timeframe to complete the project is 8 months.

### **Project Results:**

The fume hoods with these measures will result in about 80% energy savings through reduced reheating and cooling needs. The variable flow controller, auto sash controller and room temperature are modulated as per demand and occupancy.

### **Project Outcomes:**

The project will result in improved comfort level and safety of the laboratory occupants. Further environmental benefits are provided below.

- i. Annual energy savings: 387,162 kWh
- ii. Annual natural gas savings: 13,211 Therms
- iii. Annual eCO<sub>2</sub> reduction: 288 MT
- iv. Equivalent Number of trees planted: 7,467 seedlings grown for 10 years.
- v. Annual savings: \$ 27,114

**Project Sustainability:**

Facilities Management Division has agreed to operate and maintain the system in the future.

**Project Budget Breakdown:**

This request is quoted for 8 fume hoods that are located in two labs.

ECS Quote	\$56,493
Permit	\$500
Work by Others <sup>1</sup>	\$7,000
Engineering <sup>2</sup> + TAB (Testing and Balancing)	\$7,000
Student Rate	\$5,000 (For 1 year)
<b>Total Project Cost</b>	<b>\$75,993</b>

<sup>1</sup> – Refers to any work orders issued to Facilities Staff (or external contractors) for safe installation of the equipment.

<sup>2</sup> – Refers to the engineering design of the project adhering to codes and approval by Professional Engineer.