A PROGRAM OF THE TCEQ

Texas Commission on Environmental Quality
New Technology Implementation Grant (NTIG) Program

Operation Phase Annual/Final Status Report

Contract Number: 582-15-53907-1471

Grantee: Southwest Research Institute

Report for the Annual period: 2016-2017 –First Annual Report

Date Submitted: 6/29/2017

Section I. Accomplishments

Provide a bulleted list of operations of the facility during the past year.
Include exact numbers and/or estimates.

SwRI's Fire Technology Department (FTD) installed a pollution abatement system (PAS), which is comprised of a fabric-filter baghouse paired with a dry scrubbing soda ash system and an activated carbon chemical adsorption system. The purpose of this PAS is to capture and control emissions of particulate matter, as well as toxic and hazardous air pollutants from three buildings collocated in the FTD area. A schematic of the area where the system is servicing three buildings is shown in Figure 1. Current pictures of the system and its major components are shown in Figures 2 through 4.

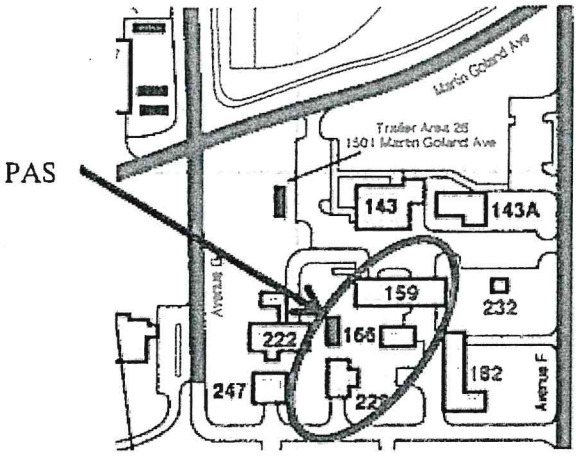

Figure 1. FTD area showing the location of the three buildings and PAS (red oval).

Testing activities performed in any of the three buildings associated with this PAS have been recorded. A close estimate of the emitted and abated emissions is logged in a per-occurrence basis; an aggregate report of the testing activities in each building is submitted in a monthly basis. However, a completely accurate emissions determination is not feasible due to the frequent changing nature of research projects and/or the unknown composition of some testing materials. The following bulleted lists indicate the facts associated with the three buildings (B159, B166, and1228) connected to the PAS during the period of July 2016-June 2017:

- The total number of tests performed in this period for this group of buildings was 122, of which:
  - 54 tests were performed in B159, representing 44% of the total tests.
  - 24 tests were performed in B166, representing 20% of the total tests.
  - 44 tests were performed in B228, representing 36% of the total tests.
- Cumulative particulate matter (PM) emissions to the atmosphere were 2.858 pounds (0.001 ton).
  - The abated amount was 282.930 lb (0.141 ton).
- Cumulative sulfur dioxide (SO_2) emissions to the atmosphere were 0.827 pounds (0.0004 ton).
  - The abated amount was 7.445 lb (0.004 ton).
- Cumulative emissions to the atmosphere of acid gases, including hydrogen bromide (HBr), hydrogen chloride (HCl), and hydrogen fluoride (HF) were 1.951 pounds (0.001 ton).
  - The abated amount was 6.533 lb (0.003 ton).
- The pressure drop across the baghouse remained constant throughout the entire period, with a value of 1.5 inches of water, due to the system's reverse-pulsed mechanism that injects air to remove the constituents captured in the filter bags. That mechanism allows maintaining the proper pressure and flow rate of the system for optimal operation.

Section II. Key Events and Issues

Report any key events that occurred during this reporting period. Please include any major project updates that impacted operations.

SwRI's FTD decided to include an 8-ft by 19-ft canopy hood that is directly connected to the existing 24-in building exhaust connection to the pollution abatement system (PAS). With this device, the time needed to capture smoke coming from testing specimen was improved. This addition has shortened the time required to channel the smoke through the exhaust vents without the need to modify the air exchange rate of the PAS; as a consequence, this has improved visibility as well as the safety of the staff involved in testing and fire extinguishing. This modification was documented in the Final Implementation Task report that was submitted on June 30, 2016.

Another key event was the incorporation of a project that required the abatement capacity of the system, without being inside the any of the three buildings connected to the PAS. The set-up for this test was located adjacent to Building 166. The project consists of evaluating a novel technological approach of neutralizing certain hazardous chemicals using a small engine running in the D-EGR (Dedicated Exhaust Gas Recirculation) mode. The exhaust from the engine is funneled into the PAS (via additional ductwork), treating acid gases such HF, and the typical products of combustion, which includes carbon monoxide (CO), carbon dioxide (CO_2), and nitrogen oxides (NO_x). Testing in this configuration is not continuous. A view of the external test enclosure is depicted in Figure 2.

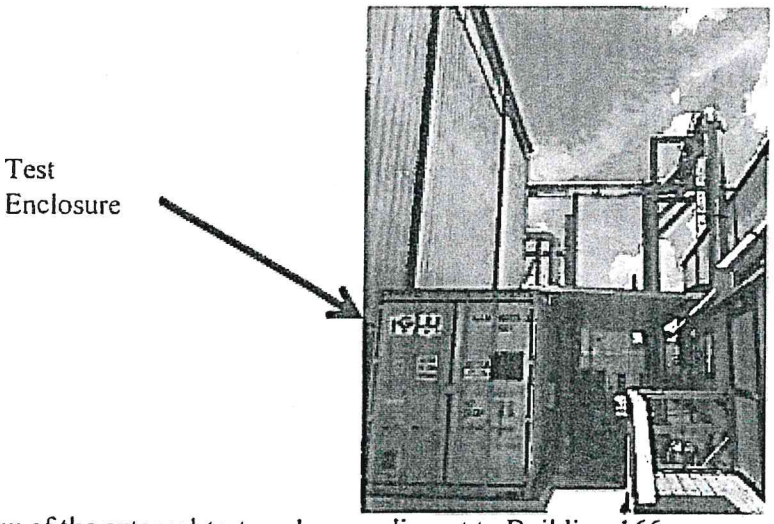

Figure 2. View of the external test enclosure adjacent to Building 166.

One minor issue occurred during a testing activity at the end previous year. The induced-draft (ID) fan experienced overheating, consequently shutting down. The reason for this issue was due to debris accumulation in the ducts in combination with a collapsing part of the furnace duct work. This created a condition where the fan operated at the highest velocity for an extended period in order to overcome pressure resistance. Minor software modifications were made during the year until the system fan was properly calibrated to the existing demands.

Report any anticipated or unanticipated problem(s).

SwRI's FTD currently does not anticipate any problem with the proper functioning of the system. Routine checks and maintenance keep the system and its components operating at the proper level. Nonetheless, due to the varied types of materials that comprise test specimens, a level of uncertainty exists as to how a particular specimen performs during a test. Due to this, the FTD initially received suggestions regarding the inclusion of a Spark Arrestor in Building 159, as a way to mitigate the chances of damaging the PAS' bags due to fugitive sparks. This proposed solution was first documented on October 7, 2015, as part of the Project Status report for the third quarter of 2015. The proposed location of this device was on the 26-in primary duct, prior to the quench vessel. After installing the device, it was found that the pressure drop through the Spark Arrestor was excessive and unacceptable for optimal fan system performance. Therefore, the device was removed. This finding was documented on the Project Status report submitted on April 4, 2016.

Proposed Solution(s): Report any possible solution(s) to the anticipated or unanticipated problem(s).

The inclusion of the Spark Arrestor is not currently feasible due to the flow imbalances it creates to the overall system. A further study indicated that due to the low velocity flow and relatively long distance between the furnaces in Building 159 and the PAS, the risk of a spark carrying to the bags (inside the baghouse) is minimal. In addition to this study, the FTD conducts and develops, as part of its testing protocol, a safety matrix prior to performing a test. This safety matrix is a preliminary study that analyzes the potential health, safety and environmental risks associated with conducting a particular test. This assessment uses empirical, experiential, and theoretical knowledge.

Action(s) Conducted and Results: Describe the action(s) taken to resolve the anticipated or unanticipated problem(s). Were the actions successful in resolving the problem?

The PAS has been operating properly and no problems, other than the minor issue described at the beginning of this section, have been observed during the 2016-2017 period.

Section III. Provide a summary of the overall state of the facility and grant funded equipment.

The PAS has been working properly during the 2016-2017 cycle. Routine checks and maintenance has been conducted, as recommended by the manufacturer.
This system has enabled the FTD to expand its capabilities to include high-smoke products, fiberglass-reinforced plastic, penetration sealants, electrical cables and lithium-ion storage batteries. Figures 2 through 5 show the current physical state of the system.

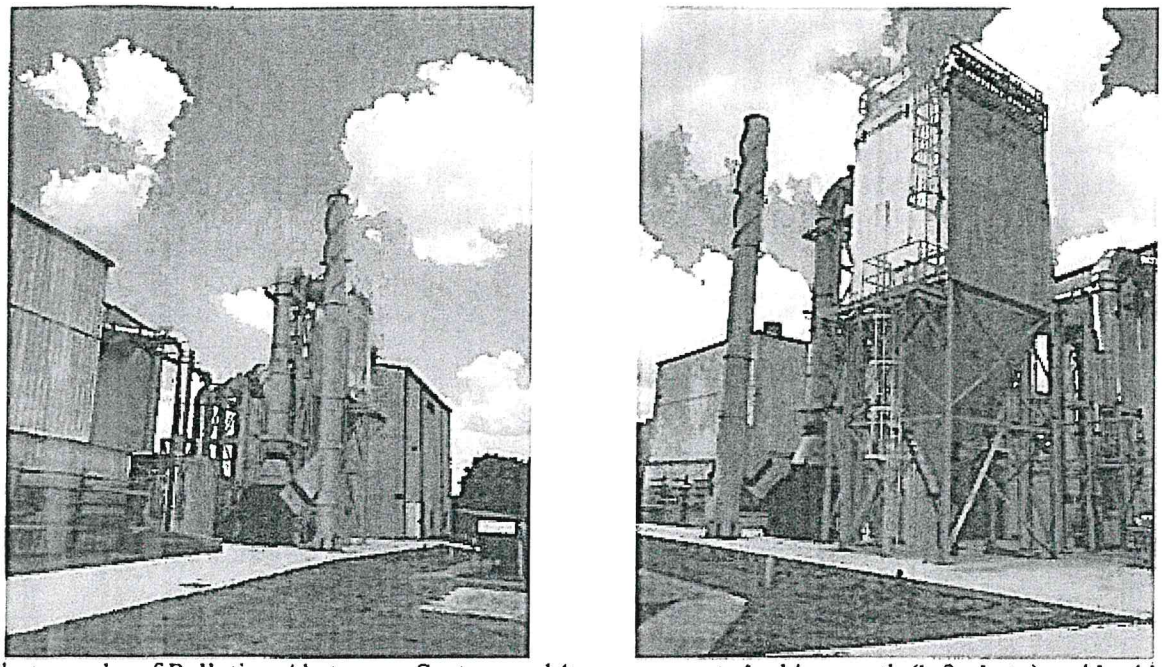

Figure 3 . Photographs of Pollution Abatement System and its components looking south (left photo) and looking northeast (right photo).

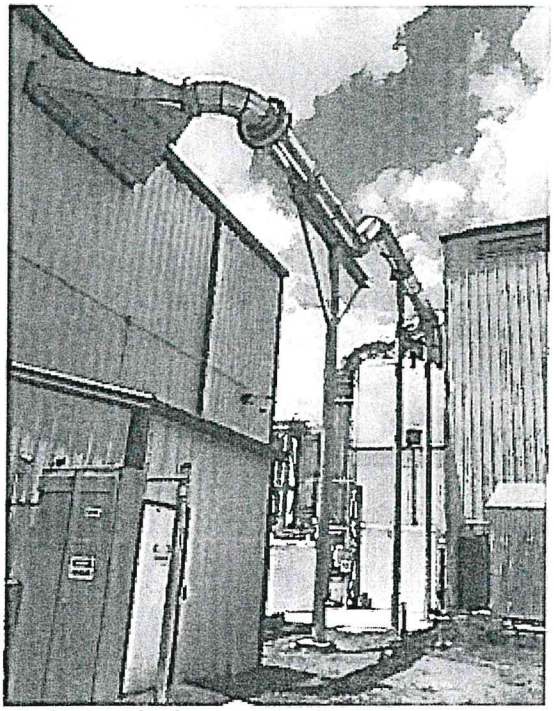

Figure 4. Photographs of the supplentary ductwork, dampers, and valves.

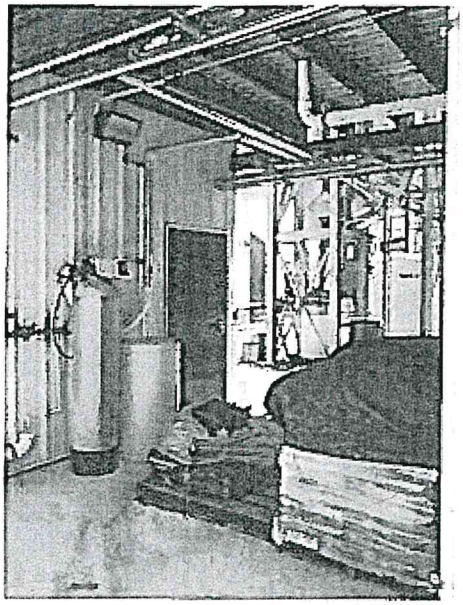

Figure 5. Photograph of ancillary building and enclosure with quench water conditioning system.

Section IV. Goals and Issues for Upcoming Period

Provide a brief description of the project goal(s) you hope to realize during the next reporting period.

The overarching goal is to keep the system operating at optimal condition. For this, an assessment of the components will be made to identify any potential issues.

Another goal is to conduct a feasibility study regarding the inclusion of a canopy hood in Building 166, with the intention of minimizing fugitive emissions and improving visibility after completing each test.

MICHAEL J. LEWIS

Authorized Official/ Project Representative's Printed name (blue ink)

Authorized Official Signature/ Project Representative's name (blue ink) Date: 6/29/2017

NOTE: *Please attach any additional information that you feel should be a part of your report.*

This form may be submitted via e-mail to your Grant Coordinator or a paper copy may be sent to the following address:

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