CHEF Management of Change Procedures

In order to make changes to CHEF, the following procedures and documentation must be developed, reviewed, and approved prior to implementing the change. When a change is proposed, it is necessary to review the Safety Failure/Hazards matrix and the operational procedures section of this report to make sure no new hazards have been created and that operational procedures remain current. This section also contains information on the maintenance of equipment along with dates and estimated performance.

Management of Change Process:
1. A need to change CHEF is identified.
2. The change is discussed with at least two knowledgeable members of the lab to get a second opinion on the necessity of the change. Details of what should be changed and how are discussed.
3. A proposal for change is created, stating the need for change and details of what the change will include. This proposal will include:
   a. relevant engineering standards,
   b. necessary sizing calculations,
   c. details of implementation of the change, and
   d. how the change affects this document, including Safety Failure/Hazards matrix and operating procedures.
4. The full proposal is discussed with the PI and experiment operators. If it is agreed upon the details of the change, the change is implemented, otherwise the change is discarded or is re-designed. The PI has the final decision on approval.
5. Implement the changes. Document these changes (i.e. the proposal) in the CHEF folder on HYPERDRIVE or on the CHEF website for future reference. Communicate the implementation and completion of the changes with others in the lab through the proper lab Slack Channel.
6. If procedures are affected by the change, update this document with new operating procedures. Detail any changes or updates to the document in the changelog at the end of the document.
7. If new maintenance / safety concerns arise from the change, note them in the proper areas in this document.

Management of New Primary Operators:
1. Have the new operator read the history and documentation on the CHEF folder of HYPERDRIVE. They should familiarize themselves with what has been accomplished with CHEF in the past, and how the experiment is currently set up.
2. Give the new primary operator this document so they can familiarize themselves with the scope of the experiment, potential safety issues with its operation, current operating procedures, and required maintenance issues.
3. Establish a multi-week mentor program to train the new primary CHEF operator on emergency, leak check, liquefying, experimentation, and warming up scenarios and procedures. Have the mentee show the existing primary operator all steps for each scenario.

Maintenance and Repair Schedule:

The maintenance and repair schedule will be kept in the CHEF work-log as a sub-tab in the Excel file labeled 'CHEF Log_rev[X]' in the CHEF folder of the HYPERDRIVE. This workbook keeps track of the CHEF experiment including the history projects and total time elapsed on individual components. This workbook also tracks the total funds spent on maintenance parts, hydrogen gas, and experimental updates. A required maintenance schedule in the document tracks required periodic maintenance. This excel file adds visibility to the CHEF experiment and allows for a predictive model to diagnose and prevent issues caused by thermal cycling.

CHEF LOG

Revision: 2019-02-11   HOURMETER: 11678

CRYOCATALYSIS HYDROGEN EXPERIMENT FACILITY STAT SUMMARY

TOTAL HOURS OF CHEFFORT
3,926

TOTAL GAS COST
$2,517.63

AVERAGE mLPH
29.7

TOTAL
MAINTENANCE COST

TOTAL
LITERS LIQUEFIED
263.2

TOTAL
EXPERIMENT UPDATE COST

CURRENT
CLIENT / PROJECT
DOE Vortex Tube Optimization

PROJECT HISTORY

Start Date	End Date	Client / Personnel	Total CHEF Runtime [hr]
2011-07-14	2013-05-29	ULA / Ron Bliesner	2,236
2015-05-01	2016-03-02	ULTRAMET / Brandt Pedrow	2,236
2016-03-04	2018-01-30	NREL / Eli Shoemake	2,752
2016-05-11		NASA / DOE / Carl Bunge	4,453