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TID-16995

BALDWIN-LIMA-HAMILTON CORPORATION
EDDYSTONE, PENNSYLVANIA

MASTER

October 4, 1962

Mr. T. A. Nemzek, Chairman
and Members of
Sodium Components Development Program
Working Group

Gentlemen:

Forwarded herewith is our Progress Report on the Sodium Components
Design Program, Contract AT(11-1)-1213, for the period ending
September 28, 1962.

Very truly yours,

R. B. Abderhalden
Project Engineer

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PROGRESS REPORT

SODIUM COMPONENTS DESIGN PROGRAM

CONTRACT AT (11-1)-1213

SEPTEMBER 28, 1962

GENERAL INFORMATION

The Baldwin-Lima-Hamilton Corporation was awarded a contract by the AEC to complete certain portions of the ALCO-AEC Contract #AT(11-1)-666. These included completing the manufacturing operations on the steam generator and erection and operation of the ALCO test loop.

Mr. Robert B. Abderhalden was appointed B-L-H Project Engineer on this contract on August 17, 1962, replacing Mr. R. E. Riley. All future correspondence and contacts should be directed through Mr. Abderhalden. He will be physically located at the B-L-H facility at Eddystone, Pennsylvania.

A meeting was held on August 21 and August 22 at Atomics International facility in California. In attendance were Mr. DeKany of AEC; Messrs. Casey, Cygan, Jones, Lencoe and Petersen of AI; Messrs. Fabregas and Phillips of ALCO; and Messrs. Abderhalden and Riley of B-L-H. The purpose of this meeting was to resolve the final test program as proposed by ALCO. As a result of this meeting ALCO corrected, edited, published and distributed the final test report APAE #122 entitled "Test Program for 30 Megawatt Prototype Sodium Intermediate Heat Exchanger and Steam Generator". The masters and a few extra copies are in Mr. Abderhalden's possession.

Also at this meeting the following points were discussed and agreement reached as follows:

a. All strain gages are to be changed from 2 to 3 gage rosettes in 1/4" size. The 3 lead wire system to have 26 gage 3 conductor, solid copper-stainless steel clad, lead wires with fiberglass jacketed insulation.

b. During the hydrotesting at B-L-H it was requested that temperature data for the fluid, air, metal, etc., be taken in order to have more complete information.

c. B-L-H will provide a testing procedure to be used for the hydrotest. The strain gages will be connected to a multiple channel continuous recording instrument.

d. AI will have a resident inspector at B-L-H during the fabrication of the steam generator.

e. AI will have a representative at B-L-H during the prehydrotest check of the strain gage and also during the actual recording during the hydrotest.

f. The strain gage location was changed on the sodium inlet nozzle. ALCO was given a marked-up drawing indicating AI desires in this respect. This drawing has since been brought up to date and distributed.

g. ALCO will send the factory calibration curves of the thermocouples which were used on the intermediate heat exchanger to AI. The remainder of the calibration curves will be sent to B-L-H.

A meeting was held on September 12, 1962 at ALCO - Schenectady. In attendance were Messrs. Redecke and Smith of AEC; Messrs. Bennett, Lacy, MacKowski, Phillips, Sayre, Seifert and Vawter of ALCO; and Messrs. Abderhalden,

Riley and Tidball of B-L-H. The purpose of this meeting was to discuss transfer of the steam generator to B-L-H and to inform those present the up-to-date status of the development contract. Part of this discussion will be recorded under the Steam Generator portion of this report. A brief description of the remainder of the points discussed is as follows:

a. Discussion was held concerning ramifications of possible tube rupture in lower tube sheet region of steam generator during operation. ALCO agreed to calculate the actual rupture strength of the different portions of the shell and advise AI of the results.

b. The welding development program was reviewed regarding the tube to tube sheet welds of the composite tubes to the inconel overlaid tube sheet. The weld configuration which had been subjected to thermal shock tests developed some cracking. A new weld configuration appeared to have considerable promise since the cracking of weld after completion of the root pass was eliminated. ALCO expected to have a formal weld procedure completed by the end of October on this new configuration. The thermal shock evaluation will not be complete at this time, but they intend to run both concurrent if at all possible.

c. The modified 2 $\frac{1}{4}$ Cr alloy, an experimental tubing, has been shipped to AI. There is some question whether this material will be tested at this time. AEC is taking this under advisement.

d. Evaluation of the actual test results and the formulation of the final reports on the actual test at the SCTI facility was discussed. It will be necessary for B-L-H and AEC to arrive at some final decision on this matter.

e. ALCO will send masters of previous reports, extra copies of reports, etc., to B-L-H in order to have everything available at a central location.

f. ALCO will supply all inspection records, mill test reports, etc., to B-L-H.

g. A possible change in the roller expanding procedure used in the tube to tube sheet will be finalized by ALCO and the report changed if this is to be desired.

h. The following is a list of material that was given to B-L-H at this meeting or was forwarded at a later date:

Sepias of two purchase sketches: 42207-1-7 and 42207-1-8 from Dunkirk. This completes Baldwin-Lima-Hamilton file from Dunkirk drawings for Dunkirk Order 42207.

Reproducible of Dunkirk Welding Procedures for Order 42207, excluding tube-to-tube sheet joints.

File of Dunkirk Purchase Orders for Order 42207.

Complete set of sepias of Schenectady Design Drawings for both the intermediate heat exchanger and steam generator.

Reproducible copy of Dunkirk Travellers for steam generator Order 42207.

Schenectady file for design and purchase of thermocouples, including Aero Research calibration charts and test reports, and x-rays of the connector for steam generator thermocouples only.

Chronological correspondence file, consisting primarily of AEC, Dunkirk, and internal correspondence, to serve as background history of the job.

File on Modified $2\frac{1}{4}\%$ Cr-1% Mo material, including United States Steel Development report.

File of Progress Reports, including various proposals, from ALCO to AEC.

NOTE: All files and data pertaining to the high temperature-high pressure test loop had previously been given to Baldwin-Lima-Hamilton.

On September 27, 1962, a short meeting was held at B-L-H in Eddystone, Pennsylvania with Dr. Lemcoe of AI and Messrs. Love and Abderhalden of B-L-H in attendance. Dr. Lemcoe had not received the finalized copy of the test program (APAE 122) so he was unable to give any specific comments at that time regarding this publication. He stated that after receipt of same he would offer his comments after he had a chance to review this document. The points discussed were as follows:

a. A recommendation was made that $1/8"$ gage rosettes be used at high stress location areas such as the junction of the nozzle to the shell. AI will explore this point further with the possibility of requesting that additional strain gages be added and advise B-L-H of their desires.

b. ALCO's drawing D-666-4-9, which gives strain gage locations, was reviewed. In order to clarify the actual gage numbering system the following may be used: Gages SG-1 thru SG-32 inclusive and SG-45 thru SG-78 inclusive will be installed at B-L-H prior to the hydrotest. The drawing specifies SG-45 thru SG-48 which apparently is in error. Gages SG-36 thru SG-44 inclusive and gages SG-79 thru SG-86 inclusive will be installed at the test facility by AI. SG-86 is the last numbered gage at this time. In a later discussion it was determined that gages SG-44, SG-79 and SG-80 should be installed by B-L-H because their use during the hydrotest would be very beneficial. The three missing gage numbers, namely SG-33 thru 35 inclusive, are used only on the intermediate heat exchanger.

c. AI will furnish a drawing to B-L-H showing actual locations of strain gages and leads that AI will install. B-L-H will use this information and attempt to keep these areas clear of strain gage and thermocouple leads.

d. B-L-H will submit to AI the information on the type of strain gages which are selected to be used.

e. The hydrotest to be performed at B-L-H will be in conformance with the ASME code, namely $1\frac{1}{2}$ times design pressure corrected for temperature.

f. B-L-H will write a test procedure to be followed for the hydrotest. Included with this report should be enlarged drawings which give exact location of all strain gage locations.

FABRICATION OF 30 MEGAWATT
INTERMEDIATE HEAT EXCHANGER
AND STEAM GENERATOR

1. Sodium to Sodium Intermediate Heat Exchanger

The last report on this unit from ALCO-Dunkirk was that fabrication was proceeding smoothly and that the tube to tube sheet welding was in process. The delivery of the unit by the end of November still appears to be a realistic date.

2. Steam Generator

A. Outstanding Material

All material is on hand either at B-L-H or at ALCO-Dunkirk with the exception of the tubing. The purchase order has been placed with Superior Tube for the tubing, and the delivery promise is February, 1963. Supplying the tubing to B-L-H is still an ALCO responsibility. B-L-H has received two shipments of material from ALCO and expects to receive the final shipment by the end of October, which consists of the following:

Upper and lower tube sheets

Upper and lower heads

NOTE: ALCO-Dunkirk reported there would be approximately a two-week delay for completion of the lower head. One of the nozzle forgings, which proved to be defective, requires replacement.

Manway covers

Thermocouples

Nozzle shields

B. Engineering

The engineering drawings are complete as has been reported. A possible change may be requested by AI regarding location of the rupture disc nozzle in the shell. After tube to tube sheet weld is formalized, it is possible that further drawing changes may be required in this area. Also, if any strain gages are added or changed, drawings will have to be corrected accordingly.

C. Fabrication

The B-L-H manufacturing personnel are reviewing the drawings. We have been assured by ALCO that the manufacturing people at ALCO-Dunkirk will be available to answer any questions which arise in the near future. The intermediate heat exchanger and the steam generator are similar in many respects, so B-L-H can profit by the manufacturing problems which have arisen during the manufacturing of the intermediate heat exchanger at Dunkirk.

It has been determined that the tubing will be bent into the sine wave configuration and hydrotested at B-L-H. Arrangements will be made to lease, buy or borrow the necessary bending equipment and dies which ALCO have on hand.

D. Delivery

No firm delivery date has been established as yet by B-L-H. The receipt of the tubing will be the controlling factor. A firm date will be established by the Production Control Department in the very near future.

DEVELOPMENT PROGRAMS

1. Welding Development

The final research and development report has not been completed by ALCO. It will not be issued until the tube to tube sheet weld is finalized for the steam generator. The welding development of the tube to tube sheet joint for the steam generator was discussed previously.

2. High Temperature High Pressure Test Loop

The test apparatus was disassembled at Schenectady and has been transported to B-L-H. The test site has been prepared and actual assembly of the tower framework was started on October 1. ALCO recommended a D.C. selenium rectifier to be used for this test loop. This recommendation is being evaluated taking into account the present B-L-H facilities. Preliminary planning has established initial trial start-up by December 3. At this time it is hoped that the preliminary checks can be made on the complete test loop prior to start of actual test program.

3. Atomics International Test Program for Immediate Heat Exchanger and Steam Generator

As mentioned previously the final report for the test program has been completed and distributed as report APAE #122.

We are attaching the present organizational chart of B-L-H.

blt
10/4/62

Baldwin-Lima-Hamilton Corporation
Industrial Equipment Division
ORGANIZATION CHART
AEC ORDER No. AT(11-1)1213
BLH Order 770-1049
SODIUM HEATED STEAM GENERATOR