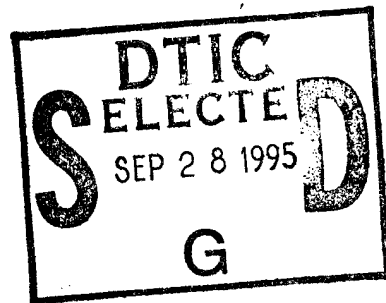


DEVELOPMENT OF AN ULTRA-SAFE RECHARGEABLE
LITHIUM-ION BATTERY



Contract # N00014-94-C-0141
ARPA Order # 9332004arp01/13 APR 1994/313ES

R & D Status Report #7

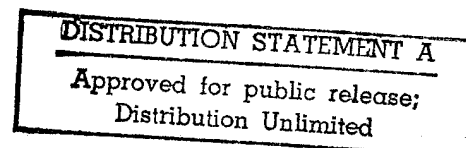
Reporting Period: 16 April to 15 May, 1995

Submitted by:

The Electrofuel Manufacturing Company Inc.

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DEVELOPMENT OF AN ULTRA-SAFE RECHARGEABLE LITHIUM-ION BATTERY

R&D STATUS REPORT 1931-1007/0

ARPA Order No.: 9332004arp01/13APR1994/313ES
Program Code No.: ARPA-BAA93-32
Contractor: The Electrofuel Manufacturing Company Inc.
Contract No.: N00014-94-C-0141 Contract Amount: \$1271728.
Effective Date of Contract: August 15, 1994
Expiration Date of Contract: February 14, 1996
Principal Investigator: J.K. Jacobs
Telephone No.: (800) 388-2865
Short Title of Work: Lithium-ion Battery Development
Reporting Period: April 16, 1995 to May 15, 1995

Description of Progress:

Work is accelerating in a number of areas and the following is a short summary of the work carried out during the period between 16th April to 15th May 1995.

The major emphasis of the work was the assembly and construction of the flexible prototype production line. In order to fast track the project, some of the assembly and construction was being carried out simultaneous with design and experimentation on other unit processes.

The assembly and construction operation included welding of the bases made from steel. The steel base is heavy and prevents any vibration in the machine. Various rollers necessary for the lamination process were installed onto the steel base. The rollers were manufactured to precise tolerances to allow for precise alignment. Two hot laminator drums were installed. The temperature of the drums could be controlled by flowing oil. The distance between the laminator drums was controlled with a precision of 0.0001". This distance can be adjusted from zero to 0.5". The load on the laminator could be pneumatically controlled.

The web handling equipment was designed to give flexibility to the process. With this machine it is possible to make multi-layered lamination, separation of layers after lamination, coating of foils, drying of electrode/separator layers and squeezing of laminations comprising of electrode materials.

An instrumentation panel was also assembled. The control panel can be used for the speed control of laminator, speed control of unwind and winding rollers, pressure control on laminator, position of laminator and emergency stop.

It was decided to use thin aluminum foils (0.0005") for the positive electrode. As received standard pure aluminum foil has a significant oxide layer from processing (hot rolling). This oxide layer was tested in the laboratory and produced a high impedance in the foil/electrode interface.

A thin copper foil will be used for the negative electrode. The thickness of this foil is 25 microns. Attempts are being made to reduce the foil thickness.

Handcrafted cells were also produced to test different chemical and physical aspects of the flexible production line. Long term tests continues on some of the early cells and we find very little fade. It is estimated that these cell could have cycle life of around 1000 cycles.

Change in Key Personnel: None

Summary of Substantive Information Derived from Special Events:
None:

Problems Encountered and/or Anticipated: None

Action Required by the Government: None

Fiscal Status:

	Total Estimate of Program	US Govt Funding Obligation	Electro fuel Contribution
(1) Amt. currently provided on contract:	\$1630421	\$1271728	\$358693
(2) Expenses & commitments to date:	\$ 559686	\$ 436555	\$123131
(3) Funds required to complete work:	\$1070735	\$ 835173	\$235562

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Figure 1: Gantt Chart

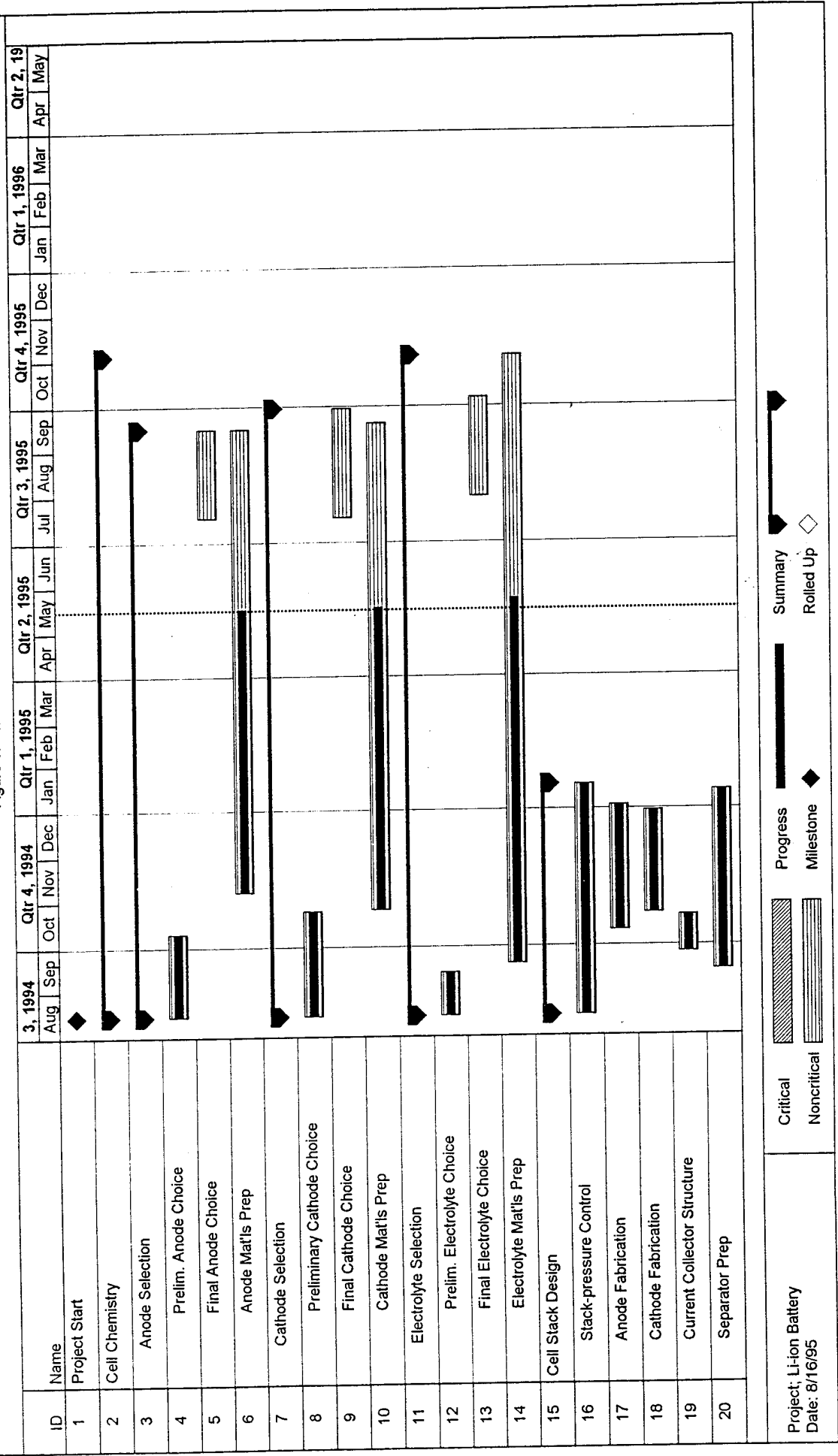
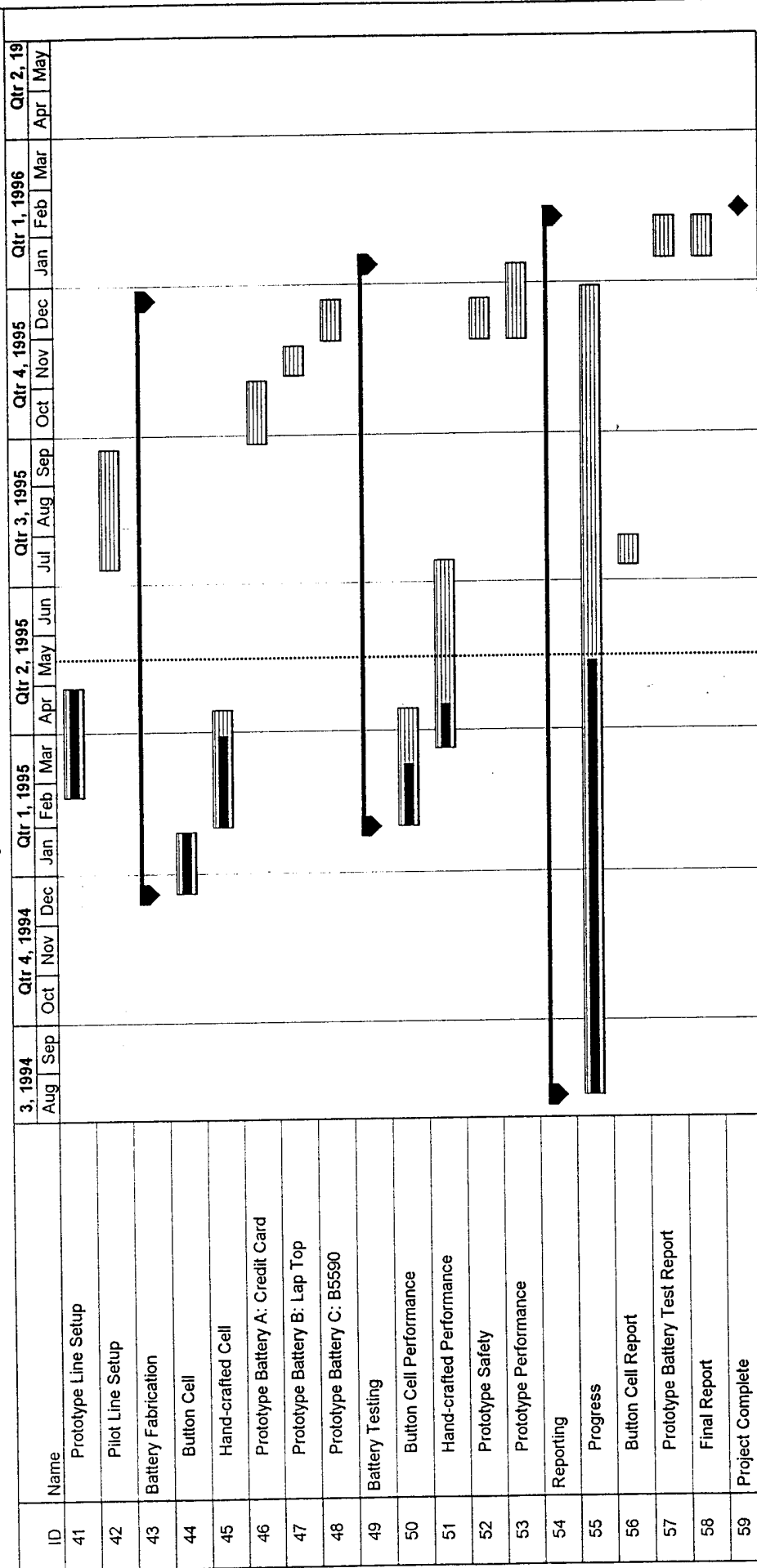


Figure 1: Gantt Chart



Project: Li-Ion Battery
Date: 8/16/95