Journal of Power Sources, 31 (1990) 355 - 357

AUTOMATION AND RATIONALIZATION OF THE PLATE-STACKING PROCESS FOR AUTOMOTIVE, TRACTION, AND STATIONARY LEAD/ACID BATTERIES

A. SCHWETZ

ELBAK Batteriewerke GmbH, Puntigamerstrasse 127, A-8055 Graz (Austria)

Introduction

Because of market trends, battery producers are obliged to develop cheaper batteries of improved quality. To reach these objectives, it is necessary to increase the degree of automation of the manufacturing process. This paper concentrates on the production of plate-stacks and the adjoining stages of battery manufacture.

Stacking of plates for automotive batteries

The present state-of-the-art demands that plate stacks for automotive batteries be produced with automatic element-stacking machines. For every demand there is the appropriate machine available on the market.

To achieve further rationalization effects in this process, it is necessary also to automate the stages both before and after the plate-stacking machine. These are:

- feeding the machine with plates and separators
- removing the stacked plates for subsequent treatment

Suitable equipment for the automatic feeding of plate-stacking machines with plates is already available. The basic requirement is to be able to feed the machine with correctly adjusted, and well-aligned, plates. The point at which the plates are removed from the machine for subsequent treatment, usually in a cast-on-strap machine, has also been solved technically. The process consists of the following stages:

- picking up of the plate stacks
- alignment of the elements according to the lugs
- examination for completeness of the plate assembly
- automatic insertion into a cassette, or directly into a cast-on-strap machine

There are two methods to control the process:

system 1: electronic counting of positive and negative plates and confirmation of the correct separation by a high-voltage test

0378-7753/90/$3.50

system 2: inspection by video-cameras that are connected to a process computer

Stacking of plates for traction and stationary batteries

Attempts to rationalize activity in these areas has not been successful to date. This is because most battery manufacturers work with relatively low batch sizes and thus automation investments are only profitable if the plate-adjustment times are extremely low.

With new concepts and the application of progressive electronics, it has been possible to develop machines that meet the demand completely and are economic for battery makers with a minimum annual production of about 50 000 cells. This equipment can be divided into three operations:

(i) stack production;

(ii) fabrication of plate connections;

(iii) insertion of the element into the cell container.

Since different companies use different technologies for battery production, these plate-stacking machines are produced in modular form, providing the customer with considerable freedom in selection. With this approach, only minor modifications are required to equipment that is already in place.

Production of plate-stacks. With new technology it is now possible to construct machines that have virtually zero adjustment times.

Fabrication of plate connections. There are three methods of making the lug connections:

- conventional welding with gas
- protected gas welding, either by hand, or by use of a robot-guided welding-pistol
- casting of the busbars and terminal heads

Insertion of elements into the cell container. Excellent technology has been developed for this operation, so much so that damage to separators is avoided.

The above equipment is applicable to the production of both traction and stationary batteries that satisfy both DIN and British Standard specifications.

Stacking of plates for sealed batteries

Equipment for inserting plate stacks into so-called 'recombination' or 'sealed' batteries has only been used to a small extent in Western Europe. This is because up to now there has been no possibility of producing these

stacks of plates automatically. Virtually all batteries that have been manufactured with recombination technology have been produced by hand. There is now, however, a new development by ELBAK that solves this problem. Automatic equipment is available for the wrapping of negative and positive plates, and afterwards for stacking into elements with a speed that matches the speed of battery production.

This development, and others mentioned above, show that automation can be brought to those stages of battery manufacturer that have hitherto been considered impossible to automate.