

OVERHAUL OF THE EAST AREA D.C. GENERATORS

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1. INTRODUCTION

The East overhaul project B073 envisaged an exchange of the reference source of the generators (replacement of the motor driven potentiometer against a 14 bit DAC with up-down control, but no parallel computer access).

In connection with the East rectifier preparation for pulsing (identical with current zero setting), the possibility to pulse (or to "zero"), generators was discussed. (Meeting of 31.1.80 organized by L. Danloy). Furthermore computer access for generators, to make them for physicists similar in handling to rectifiers, was considered as desirable, and would at the same time facilitate automatic "zeroing" during absence of beam.

2. SUITABILITY OF THE PRESENT GENERATOR CONTROL CIRCUITRY FOR PULSED OPERATION (or current "zeroing")

Pulsed operation requires from a number of components a more reliable operation (i.e. polarity reversal of the excitation current) and more precise adjustments (i.e. current feedback).

These parts of the existing electronics are particularly weak :

- Obsolete plastic moulded polarity decision logic combined with marginally designed zero detection.
- Hall modulator based summing amplifier for current loop (obsolete already 5 years ago !).

To avoid repetition current overshoots (stress for the brushes and armature of the generator) the current reference should be rate-limited.

CONCLUSION : The whole control circuitry should be replaced if the generators are to run in pulsed operation or frequent current "zeroing" mode.

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3. UTILITY OF GENERATOR ELECTRONIC REPLACEMENT

The pros are mentioned in the first paragraph.

There are also some cons to be considered :

- Limited mobility of generators compared with rectifiers
- Much lower efficiency than rectifiers (~ 80% against ~ 95%)

It might well be that for these reasons one will stop one day motor generators and replace them by rectifiers.

4. RECONCILIATION OF COSTLY ELECTRONIC REDESIGN AND ENERGY SAVING

It is difficult in view of the expected savings (see L. Hoffmann's draft PS/MU/EP/LH/gm of 7.2.80) and the uncertain future mode of the East area as test zone to justify expenses in the order of 15 kFS per generator. Energy savings would be higher if the area were supplied with a special pulse (slow repetition rate or during a limited time) which permits even to excite and de-excite slowly spectrometers.

A way out of the dilemma would be a dual purpose electronic design. A preliminary study showed *) that it is conceivable to design the electronics in such a way that it would fit - only by addition or exchange of a few cards or components - equally well for generators and for rectifiers.

If one likes to abandon the generators for reasons given under 3., the electronics could be recuperated and installed for < 3 kFS/per unit in the new designed rectifier power cubicle.

The proposed dual purpose electronic version fits equally well for small rectifiers (10 kW range) as for generator comparable sized rectifiers of 300 kW due to the static polarity change (thyristors).

A number of circuits used for East rectifier overhaul can be used - some with slight modifications - in the dual purpose electronics, which facilitates maintenance and spare parts.

*) G. Coudert, R. Mosig - Electronique double usage pour génératrices et redresseurs.

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5. COST ESTIMATION

The present generator electronics would be replaced by a "dual purpose" electronics equipped for generator operation. Generators could then be set (including zero) and be pulsed under computer control. Space and wiring for single transceiver is provided. The excitation winding of the Siemens generators would be supplied via a 3-phase bridge circuit with thyristor polarity reversal from the existing transformer.

- Estimated cost per unit : 15 kF.
- For 33 generators 495 kF
 (29 Siemens and 4 Oerlikon generators)

There are some West Area rectifiers (8 x R2B and 15 x T1B) not equipped for computer control and pulsed operation. It would be highly desirable to have a uniform control system and therefore to convert this rectifier electronics as well. There is a high probability that the rectifiers - in particular the T1B type - could advantageously be used for LEAR. The electronic used for the conversion would be similar to this used for East rectifier overhaul.

- Estimated cost per R2B unit : 13 kF
 - for 8 supplies 104 kF
 - Estimated cost per T1B unit : 12 kF
 - for 15 supplies 180 kF
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- Total generators + rectifiers 779 kF

A number of plug-in units and components for this programme would be identical to the East overhaul version, so that an engagement for 1980 of 200 kF would be possible.

The production could be finished in 1981, but the installation depends on the availability of supplies to be converted from end 1981 onwards.

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