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TITLE: Voltage ripple in full-wave rectifiers with a capacitative filter

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TEXT: Accurate formulae and graphs for calculating the percentage ripple in full-wave rectifier circuits with a capacitative output filter are given. First, three bridge-type rectifier circuits (see Fig. 1) are considered. The percentage ripple for the k-th harmonic in these can be calculated from the formula:

$$k_{\Pi k} = k_{\Pi ko}\, \xi\left(km_{\Pi},\ k\frac{r_a}{r_H}\right) \qquad (1)$$

where $k_{\Pi ko} = 20/\pi km_{\Pi} C_o r_H \alpha$ is the ripple factor for an ideal rectifier in which the internal resistance r_a is much smaller than the load r_H; ξ is a correction factor taking into account

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the losses due to a finite r_a and m_{Π} is the ratio of the basic frequency of the rectified voltage to that of the input (at the secondary of the rectifier transformer). Curves giving ξ as a function of kr_a/r_H are illustrated in Fig. 2 and these can be used for practical calculations. Graphs can also be employed for single-phase and three-phase voltage-doubler circuits. The graphs and Eq. (1) were verified experimentally by constructing a three-phase bridge rectifier circuit and a three-phase doubler system. The measured results were in good agreement with the calculated curves. For approximate calculations it is possible to use the formula:

$$k_{\Pi 1} = N/C_o r_H \qquad (12)$$

where C_o is thecapacitance of the filter in μF and r_H is the load in kΩ; N is a coefficient which is dependent on the rectifier system and on the ratio r_a/r_H. For a full-wave rectifier $N = 2.9 - 2.5$ and for single-phase doubler circuits

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it is 2.8 - 2.2. N = 0.48 - 0.32 for three-phase circuits, while for three-phase doublers N = 0.15 - 0.07. It is pointed out that, other conditions being equal, the use of doubler circuits results in a reduction of the ripple. Thus, if in the doubler circuit the ripple is 0.5% for currents of up to 280 mA, this increases two- or threefold in a bridge circuit for output currents ranging from 100 - 280 mA. There are 6 figures and 1 table.

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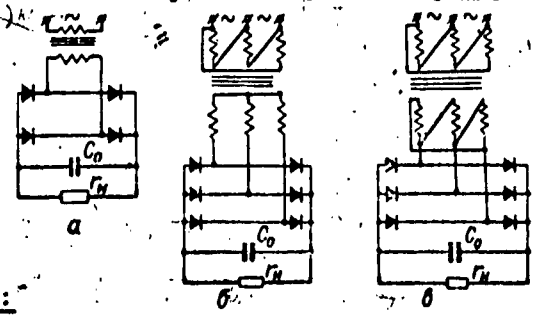

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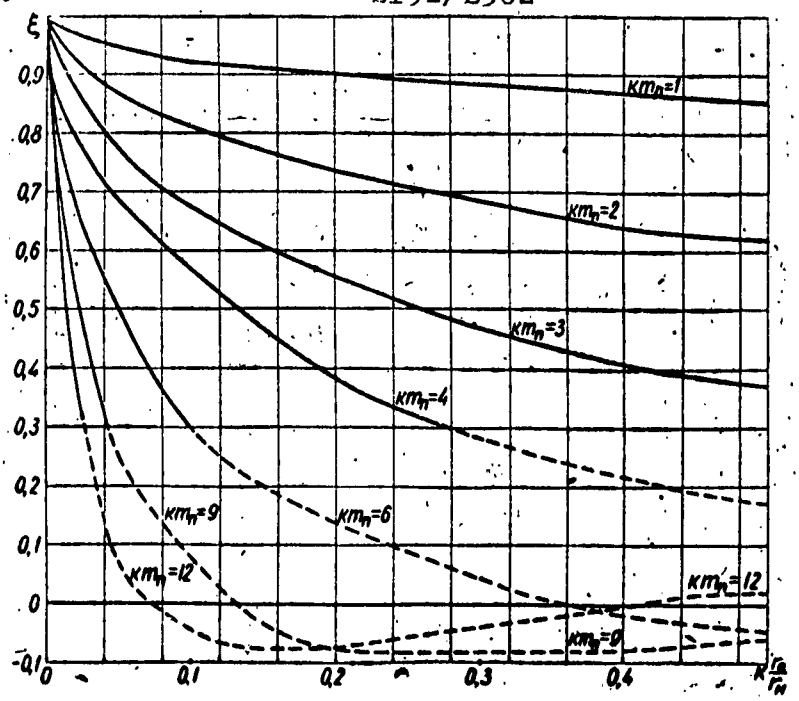
Fig. 1:

Voltage ripple ....

Fig. 2:



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Figs 1 and 2 (1 1, 723, 724) [illegible]