

The designer can freely choose any value for each of the following 12 design parameters: vessel diameter, measured diameter (a chord of the vessel section), vessel height-to-diameter ratio, wall thickness, insulation thickness, absorption coefficient of the liquid, density of the liquid, velocity of liquid motion, time constant of the detector, source activity, detector efficiency and Geiger tube diameter. These values are then entered on the corresponding 12 cards and the program is run. A response table is provided, giving the total counting rate for each centimeter of liquid height, as well as the following complementary information: resolving power, statistical error, hysteresis, dynamical error, total operative error, percent error (relative and total), radiation field in the detector area, lead shielding needed around the source.

The program also answers the question as to what is the minimal liquid level measurable, with an error remaining within the limits requested by the plant operators.

## DIGITAL IMAGE PROCESSING SYSTEM

### A. Gayer

A digital image processing system was implemented for an HP-1000 computer. The system was specifically designed to enhance and restore radiographic images, due to the limitations and needs existing in this field. However, the system is not restricted to radiography, and it constitutes a basic image processing system for all kinds of images.

The system hardware includes a TV camera and an A/D converter (Hamamatzu C-1000), which are interfaced to an HP-1000 mini-computer by an HP-IB general purpose interface.

The software package which was developed contains control programs for the C-1000 system, display programs for a line printer or plotter and image processing programs. The image processing programs include various operators, such as contrast stretching, thresholding, edge enhancement, smoothing and grey level distribution. Fourier analysis programs which were developed for image restoration are based on fast Fourier transform (FFT) and application of various filters, such as low and high pass filters, narrow band filter and inverse and Wiener

filters. Two examples showing the results of contrast stretching and filtering are shown in Figs. 17 and 18, respectively.

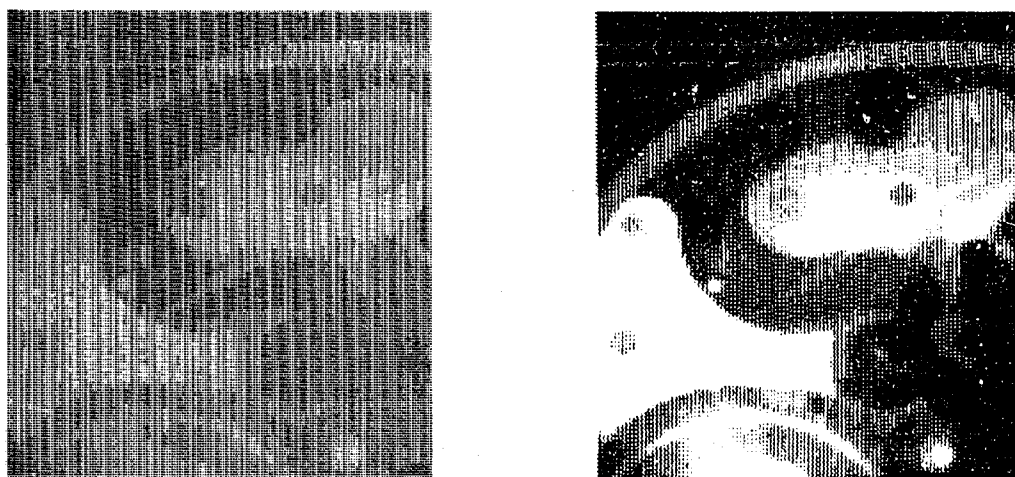


Fig. 17

The effect of applying the operator for contrast stretching on a low contrast radiograph of a watch

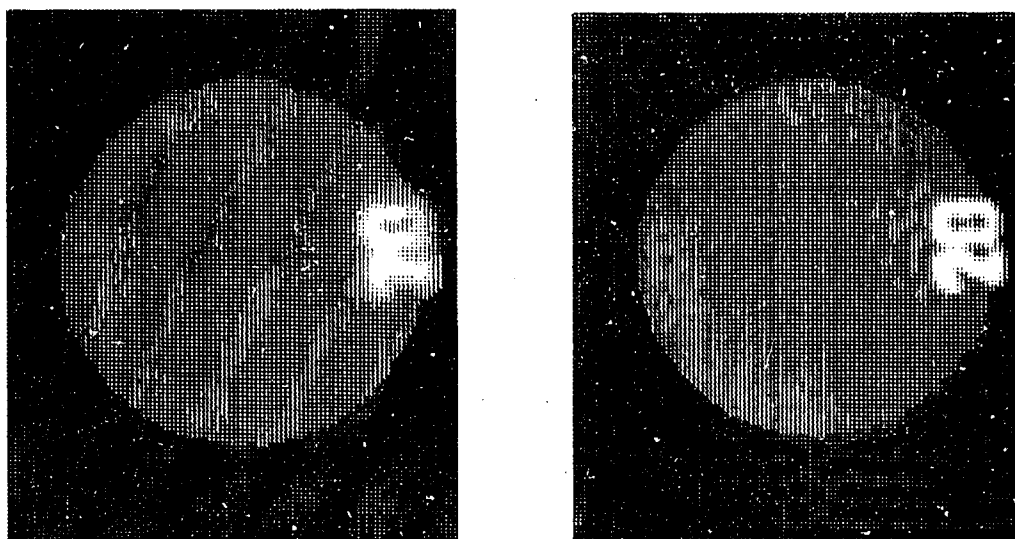


Fig. 18

The effect of applying an inverse filter on a blurred radiograph