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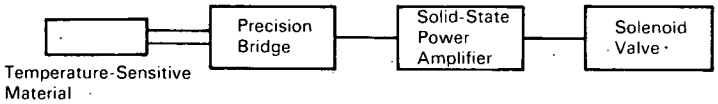
Brief 68-10337

NASA TECH BRIEF

Temperature or Pressure Controller



The problem:

A closed-loop temperature controller with higher sensitivity, higher reliability and higher power capacity than any commercially available unit was required to support a combustion research study.

The solution:

A thermally sensitive semiconductor material is employed as a sensor and coupled into a solid-state power control, which operates the propellant valves supplying the system being controlled.

How it's done:

A silicon chip is used as the thermal sensing element. It is embedded in a ceramic support that provides thermal and electrical insulation from the mechanical structure, so that it responds only to the temperature variations in the fluid stream that it is sensing. The sensing element is connected as the variable leg of a high-resistance bridge which, in turn, provides the operating signal to the solid state power amplifier that supplies the actuating current for control purposes. The unit measures temperatures from $-423°F$ to $+500°F$. For gas stream temperatures between $-100°$ and $0°F$, control sensitivity better than $1°F$ was obtained. The amplifier output was 10 amperes into an inductive load on a 28 vdc facility valve circuit.

The very small mass of the sensing element provides immediate response, and its large change of resistance with temperature produces a strong output signal from the bridge ($\approx$15 mv/degree F with 20 vdc input).

Notes:

1. This system can also be used as a low-pressure controller by using a polymeric sensing element, which changes resistance with pressure. The range is adjustable from 3–10 psig. This technique is directly applicable to many automation systems where low pressure processing requires critical control of feed stream pressures. The elimination of the conventional electromechanical coupling components increases the reliability of the system.
2. Inquiries concerning this innovation may be directed to:

   Technology Utilization Officer
   Lewis Research Center
   21000 Brookpark Road
   Cleveland, Ohio 44135
   Reference: B68-10337

Patent status:

No patent action is contemplated by NASA.

Source: J. D. Gillett
of North American Rockwell Corporation
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Lewis Research Center
(LEW-10297)

Category 01

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