STRAIN GAUGE SIGNAL MODIFICATION USING THE DIOSNA-BOOTS GRANULATION END POINT CONTROL SYSTEM AND ITS RELEVANCE TO SCALE UP PROBLEMS

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Kay and Record (1978) and Record (1979) have reported the use of the Diosna-Boots Mixing Probe for the end point control of granulation processes in high speed mixer-granulators. However, little is known about the various components of the strain gauge signal and its modification by the End Point Controller (EPC).

This investigation has monitored the strain gauge signal before it enters the EPC and has shown that there are basically two components. The main component occurs at a frequency identical to the frequency of blade movement beneath the probe and has been confirmed by calculation and by stroboscopic measurement. The second component, the natural resonant frequency of the probe, has been identified from single impact tests to be reported. Analysis of the results has shown that this frequency is of the order of 78-80Hz and that the damping coefficient is independent of the size of the impact force. This would imply that any alteration of the damping characteristics of the probe during use are due to changes in the granular bed. The use of different plastic granular materials in the Diosna P50 mixer-granulator has highlighted some important changes in the probe signal with increasing load and different types of plastic and these will be presented and discussed.

Once the strain gauge signal enters the EPC it is amplified and electronically filtered. The effect of the filter has been determined using a Feedback Function Generator FG 601 to produce a sinusoidal signal which could be fed to the EPC replacing the probe signal. The emergent signal from the EPC was fed into an u.v. oscillograph. The frequency of a constant amplitude signal was altered from 1-120 Hz and the size of the signal output measured on the u.v. trace.

Fig.1 shows the relationship between the percentage of original signal passing the filter and the signal frequency.

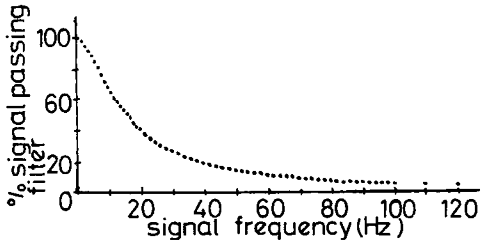

TABLE 1

Diosna mixer	Blade frequency at high speed (Hz)	% signal passing filter
P25	17.5	45.8
P50	14.4	53.7
P400A	6.45	82.0
P600	5.7	84.9
P1000	4.5	89.4

The resonant frequency is almost completely cut out being reduced to 6% of the original value, but the main component i.e. the blade frequency is only partially reduced. This has important consequences for scale up operations because different sizes of Diosna P mixer-granulator have different main impeller speeds. To control the end point of a granulation process a Pulse Height control setting enables the EPC to ignore the small amplitude signal so that only the large amplitude signal associated with the granulated material may be analysed.

Table 1 indicates the differences which may occur between different models of Diosna P mixer-granulators. For example, a scale up operation from the P25 to the P600 will result in a 79% increase in the size of the signal. If the Pulse Height setting is not increased accordingly, the probe system will indicate a premature end point.

D. Kay and P. C. Record (1978) Manuf. Chem. Aer. News Sept. p45
P. C. Record (1979) ibid Nov. p65.

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