Chips are fed from Chip Bin through a chip meter to the low oressure feeder. The chip meter is a bucket type volume measuring device, the speed of buckets can be increased or decreased thereby, the feed rate. This is complied with a R. P. M. Integrator on panel which gives total chips flow.

The low pressure feeder feeds the chips to a pre-steaming vessel. The vessel is under steam pressure of around 1.5kg/cm² and the L. P. feeder provides as well a seal of this pressure to the atmospheric pressure in the chip bin. Steaming vesel pressure is controlled by a pressure controller controlling operation of two control valves - one direct acting, the other reverse acting. Leaving the steaming vessel chips enter the chip chute. At the top region of the chip chute a gammaray Isotope source with a detector is fixed to monitor high level Indication and operate an announciator circuit to give audible alarm in case of high level in the chute. Bottom leg of the chip chute is provided with a level controller to transfer excess liquor leaking from the high pressure feeder plug to a level tank ultimately to be cycled again in the system.

The chips thus leaving the chute enter the High pressure Feeder. The H. P. feeder saturating the

A. K. Das, Senior Instrument Engineer, The Titaghur Paper Mills Co. Ltd

Continuous Digester Instrumentation

This article describes and discusses process Control Instrumentation in Kamyr Continuous Digester at Titaghur Paper Mills Co. Ltd., Kankinara. Recently in India the concept of delignifying the wood and bamboo chips in a Continuous Digester is gathering momentum. As we know the conventional batch Digesters are having some inherent limitations and Continuous Digester has made good stride on the following points over the former.

- 1) Compact plant with smaller storage tanks compared to its output capacity.
- 2) Saving in heat value as the digesler is not on batch and heatingcooling cycle is absent.
- 3) Partial pulb wasing done inside the Continuous Digester.
- 4) Increase yields as claimed.
- 5) Uniform operation and superior pulp quality.
- 6) Steady demand of steam ctc.

The foregoing benefits have been possible to achieve by dint of heavy process control instrumentation apart from the special types of feeders, liquor distribution arrangement inside the digester and extraction of liquor through strainer by sequences and suitable machinery etc. those are used. We shall be describing the instrumentation of a plant rated 150 Tonnes of air dry pulp production per day.

chips with top circulation liquor flow, sends the chip mass on the top of the digester through top separator while maintaining a seal between low pressure at chip chute and high pressure of the digester. The top circulation liquor before being pumped in to the H. P. feeder is measured for temperature and flow. The temperature is being recorded in panel receiving a transmitted signal from a field transmitter. The flow measuring device deploys conventional orifice plate as primary element with a field flow transmitter and an Indicator on panel.

A flowmeter with orifice as primary element has been incorporated recently in the High pressure feeder to chip chute circulation line; serious consideration is afoot to replace it by a magnetic flowmeter. A fresh mixture of white and black liquor in definite proportions as required by the cooking process is fed to the digester impregnation zone. A magnetic flow Recording Controller controls the flow of white liquor with reference to its setting index, likewise the Black liquor exception being the primary element in this case is a concentric orifice plate.

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These mixed liquors after the high pressure pumps are once again measured for flow prior to its entering the digester as high pressure liquor.

Now from the top separator chip mass travels downward through several zones before finally coming out as partially washed pulp from the bottom of the digester. These are impregnation zone, Heating and cooking zone, diffusion and washing zone and quenching or cooling zone.

The top separator screw is provided with an extended spindle which at its lower end with arms rotates inside the chips impregnated with liquor. The torque experienced by the arm and spindle is transmitted and converted into proportional pneumatic output signal by a transmitter to monitor the top digester chip level on the central graphic control panel.

The cooking condition inside the digester preenvisages that the hydraulic pressure inside the digester is to be maintained at a level which will arrest any flashing or boiling at the temperature of the heating circulation liquor -upper & lower. This pressure control inside the digester is achieved by a pressure controller. The system consists of a pressure transmitter (field mounted) which sends out proportional pneumatic signal between 3-15 p.s.i. to a pressure Recording controller on central control panel. The pressure controller in turn actuates two control valves in field with reference to the setting index and actual measured and transmitted pressure signal from the digester. The mode of control is to admit cold compression liquor through the bottom nozzles by one control valve inside the digester in case of digester pressure falling below the desired set point and the other control valve releasing liquor from digester, in case the excess presure, to the lower flash tank, thereby, hydraulic balance is maintained inside the digester. Since the digester is hydraulically full all the time, the continuous pressure control is achieved without any trouble. The temperature inside the digester is increased in two steps by circulating the digester liquor through heaters. Withdrawal of liquor through strainer from the digester to the heaters is being done through a sequence control timer, four numbers of sequence control valves out of which two are grouped in each sequence.

The timer affects the sequential operation of one group of control valves keeping the two valves open for an average period at 80 seconds to 1 minute while the other group remains shut. In the next half cycle the later control valves open, the former group remains shut. The cycle of sequential operation of control valves are maintained during digester operation to ensure cleaning of the strainers by the plug or mass of chips descending down wiping out the fines etc. from the surface of strainers. The control valves used are butterfly flap type with ON-OFF control action, snap acting.

Upper and lower heating circulation liquors temperature is controlled by Temperature Recording Controllers. The controller regulates the quantity of steam to Heaters to keep the liquor temperature coming out of Heater as per setting index on the controller.

Further to the cold compression liquor injected to the digester by Pressure Recording Controller as stated earlier, cold washing liquor is introduced to the bottom scraper to quench and cool the pulp. This is achieved by a flow recording controller which controls the dosing rate of liquor according to process requirement.

Pulp from the digester is extracted from a remote operated Hand valve, cylinder operated ON-OFF type and thereafter goes to Blow Unit via a metal trap. From the blow unit two Hand controlled plug valve, the % opening of which can be controlled from the control panel discharges pulp in two lines. These lines are further provided with two V-ball valves controlled by the magnetic flow recording controller, the magnetic flow transmitter is installed on the unified line on the down stream sides of the Vball valves.

The consistency of pulp leaving the Blow Unit is measured by Watt-air method. The power taken by the disintegrator inside the Blow Unit is measured and converted into pneumatic signal which registers directly in terms of consistency, The power taken by disintegrater is being directly proportional to the consistency of pulp inside the blow unit.

COMPUTER CONTROL SYSTEMS

Computer control application has found its place in continuous cooking process in countries like U. S. A. Both analog and digital computing systems are deployed. The cost of installation is justified where rated production is very high, the process variables such as wood quantity and quality, moisture content, Kappa number, blow pulp consistency are non-uniform or the quality of the pulp product is to be varied often.

Success of computer application will largely depend upon accurate and dependable measuring devices, trouble free and sustained performance as this will be feeding data to the computer network. Programming the computer and determination of parameters on non-uniform and mixed type raw materials such as wood and chips are also essential.

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