

TRIPASS-2™

The operation of peripherally drilled calendar rolls heated by a liquid heat transfer medium is impaired by the fact that the temperature of the medium drops when it passes through the roll. For a typical high performance roll in a multi-nip calender with a throughput of 20 liters per second and a heat load of 800 kW, the temperature drop of the thermal oil in-out is approx. 10 °C. Transferring its energy to the roll, this temperature difference is transferred to the roll body, causing temperature distortions in circumferential direction. This is called the "Polygone-Effect". The name was given because on top of the bores with hotter oil, the thermal expansion is more important resulting in a loss of roundness of the roll body. E.g. on the tending side of a DUOPASS roll with the parameters indicated above, every second bore is 10 °C "hotter" than the adjacent one.

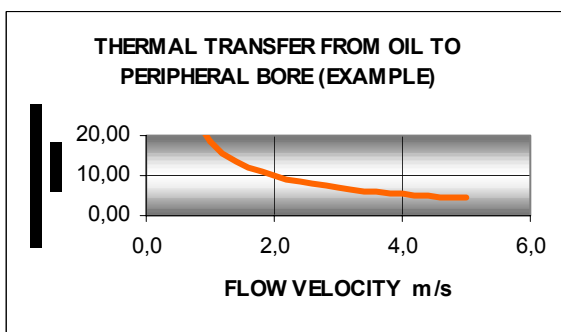


Fig.1

An effective method to reduce the temperature differences in the roll body utilizes the dependence of the heat transfer coefficient from the turbulence of the flow which is a func-

tion of the flow velocity (Fig.1). As can be taken from the diagram, the heat transfer from the thermal oil to the peripheral bore is effected with an 10 °C loss of temperature at a flow velocity of 2 meters per second. This is due to an thin film of immobilized thermal oil acting as an insulating barrier for thermal transfer. The heat transfer coefficient is given the name "Film Coefficient" for this reason.



TRIPASS-2™-DESIGN of Peripheral Bores

Fig.2

Increasing the flow velocity to 4 m/s, the heat transfer is improved by partly reducing the film with a more turbulent flow. The temperature loss drops to approx. 5 °C. In a TRIPASS-2™ design of flow, groups of three peripheral bores (Fig.2) are connected in a way that the flow is directed from the tending to the drive side in two bores and returned in one, thus doubling the flow velocity.

By this means the temperature difference between adjacent bores on the tending side is 5 °C only, though the temperature drop of the thermal oil is still 10 °C. The temperature in the roll can be even further smoothed. More advanced means of temperature drop compensation (TDC) will be the topic of one of the next Technical Newsletters.