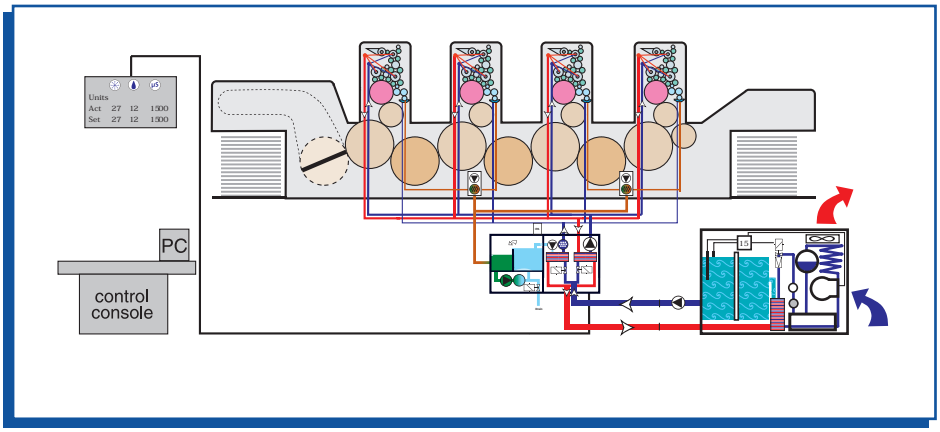
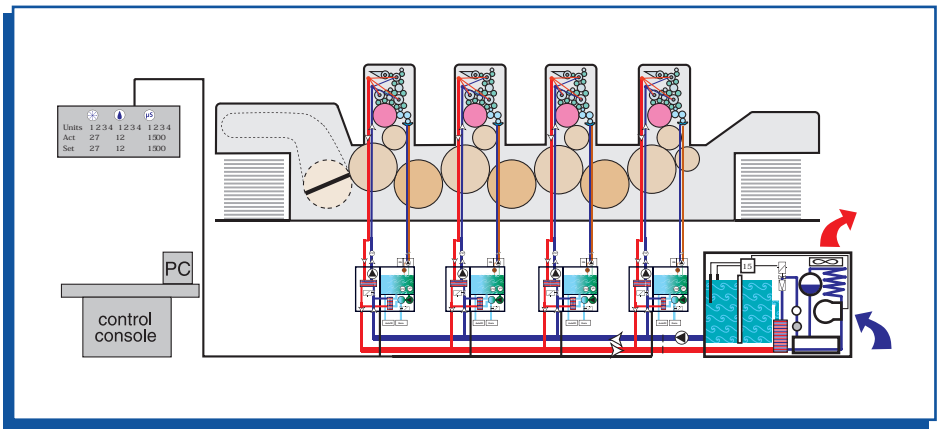
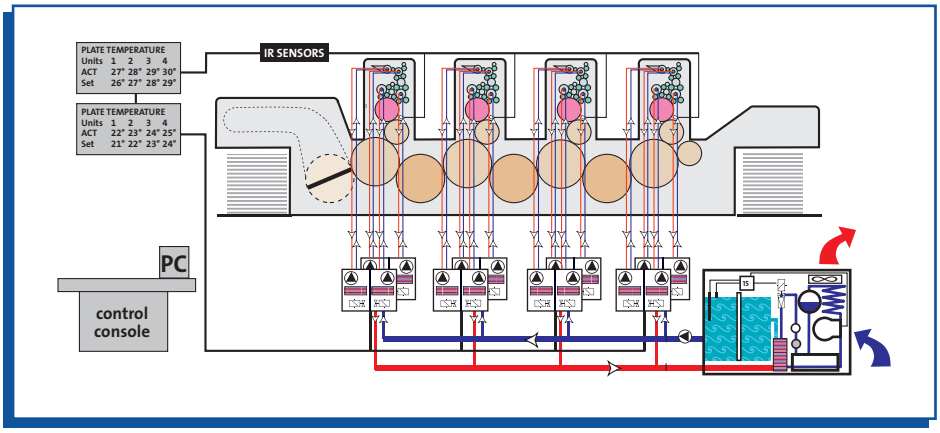
Configurations





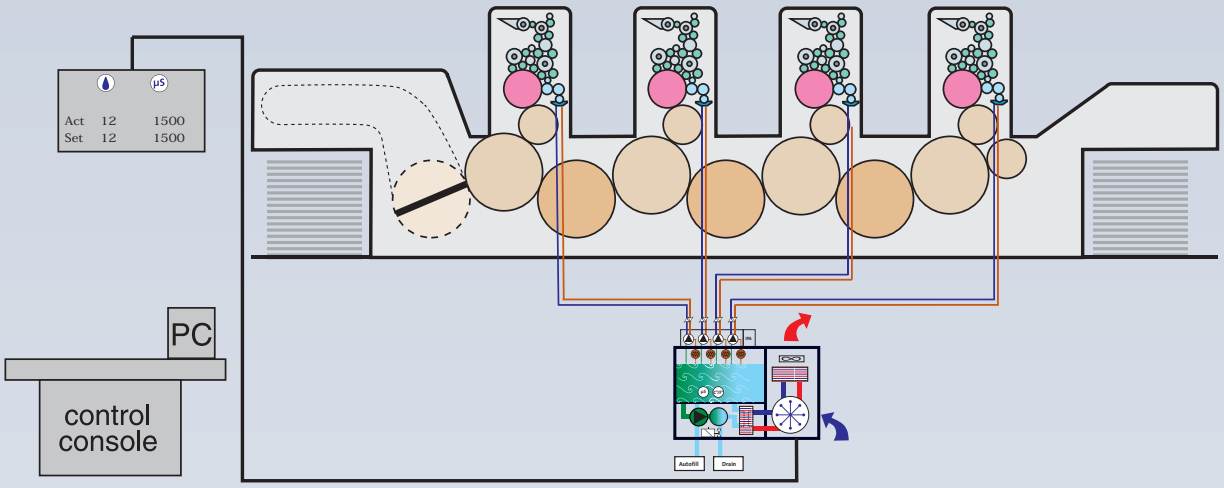


- Single-Tank DWC with integrated cooling
- Multi-Tank DWC with integrated cooling
- Single-zone Combi Systems with remote cooling
- Multi-zone Combi Systems with remote cooling
- SDMI
- MDSI
- IRTC by remote cooling with integrated immersion heater
- Single-zone IRTC with remote cooling
- Multi-zone IRTC with remote cooling
- Multi-zone IRTC with IR sensors and remote cooling
- Multi-zone IRTC with remote cooling
- Multi-zone IRTC with IR sensors and remote cooling
- Total-zone IRTC with IR sensors and remote cooling

CONSISTENT TEMPERATURE WARRANTY
COOL GRAPHICS

COOLGRAPHICS
ENERGY/ENVIRONMENT/PROCESS-CONTROL

Single-Tank DWC with integrated cooling



Central tank dampening water circulators (DWCs) cool the dampening system for all printing units from one central tank. Normal central tank DWCs maintain a constant temperature in this tank. One or more pumps supply water to the pans with a constant flow. Cooling is a product of water temperature and flow, so a central tank DWC delivers constant cooling to the press*).

Heat generation is a function of printing conditions (idling, acceleration or printing), the dampening system (number of rollers, their settings, Delta-drive etc.) and the printed job. Idling does not generate heat, acceleration generates more heat than a constant speed, higher speeds, more rollers and Delta-drive create heat, and big black solids generate more heat than thin yellow texts. This creates fluctuations in both the overall and between the units heat generation. With constant cooling this will create dynamic temperature fluctuations in the pans and between the units, which will create fluctuations in the ink/water balance and printing quality.

A tank with a lot of cold water secures a consistent cooling. A faster flow gives more cooling and less temperature fluctuations related to changing printing conditions and across the pan. All DWCs are constrained by the return flow, which makes this concept a very important matter. Central tank DWCs have a complex return flow, as it – one way or another – must return back to the same central tank from all units.

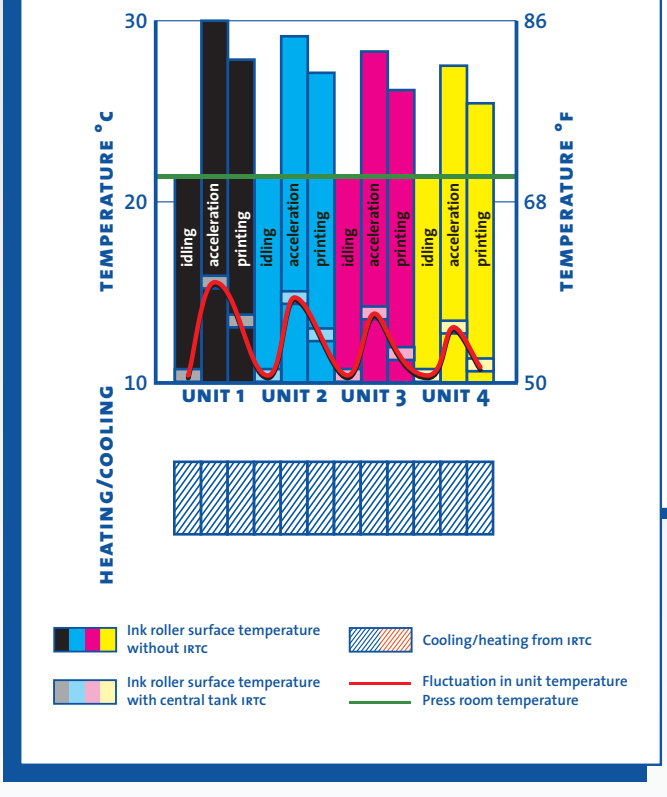
The only way to adjust the cooling capacity in a constant flow system is to change the temperature. This takes a lot of time with a big tank, so a conventional central tank DWC cannot change the cooling in relation to the heat generation. Only sophisticated new central tank DWCs like Royse's Clearwater line can reduce the overall temperature fluctuations in the pans, and no central tank DWC is capable of compensating for temperature fluctuations between the units.

A central tank DWC mixes the dampening water from all pans in the tank. This put a heavy load on filtration. Maintaining an acceptable level of filtration for process colors is not a problem for a good central tank DWC, but the water will contaminate faster than with multi-tank DWCs, and special metal, PMS and UV colors contaminate the central tank dampening water fast. Royse's central tank Clearwater line also improves the level of filtration, which maintains a consistent dampening water quality for a longer period than normal central tank DWCs, but contamination between the units will take place in any central tank DWC.

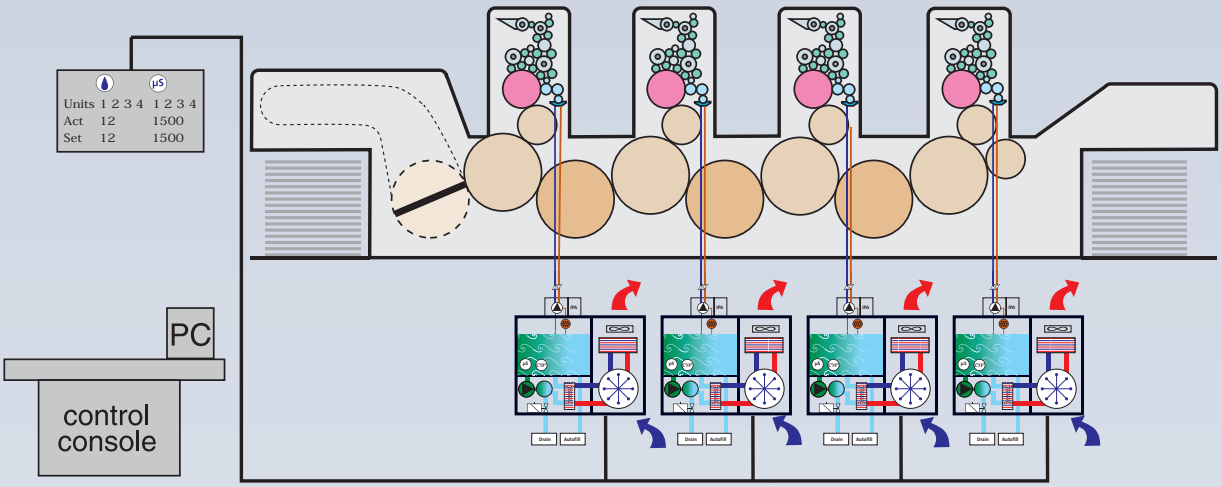
A consistent dampening water temperature minimizes problems with the ink/water balance, reduces waste, minimizes ink build-up on the rollers and reduces downtime for dampening roller cleaning. It generates an overall higher and more consistent printing and makes it is easier to print without IPA. A consistent dampening water quality minimizes problems with the ink/water balance, makes it easier to print without IPA and improves the overall printing quality. It reduces the down time for changing dampening water and cleaning the dampening water system.

Most central tank DWCs have an integrated cooling compressor. A DWC must per definition be close to the press, so the DWC heat generation from the cooling compressor will be delivered to the pressroom close to the press. For bigger and faster presses this heat generation can be significant (more than 1.0 kWatt & 0.2 tons per unit), and it is a strong advantage to use a remote-cooling source.

*) See explanation at page 15

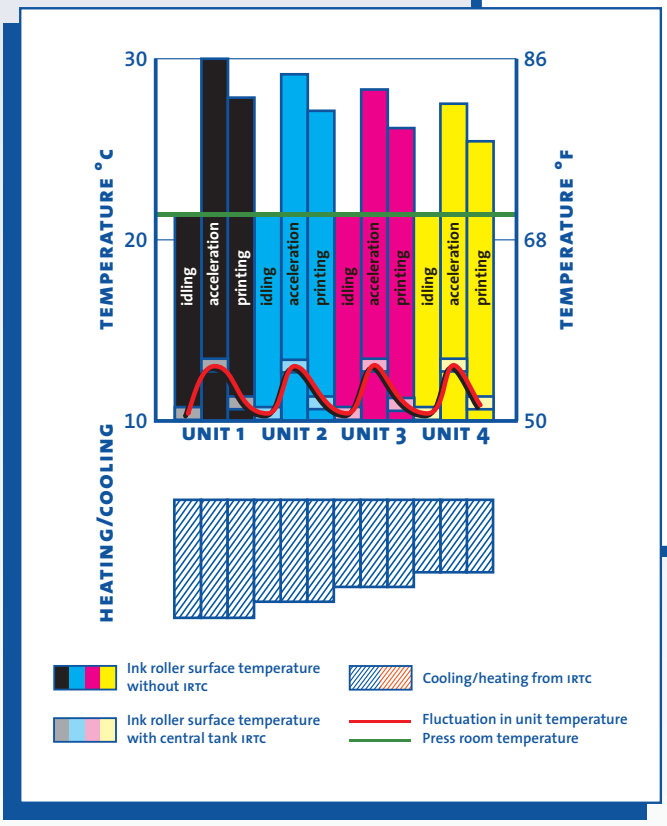


Multi-Tank DWC with integrated cooling

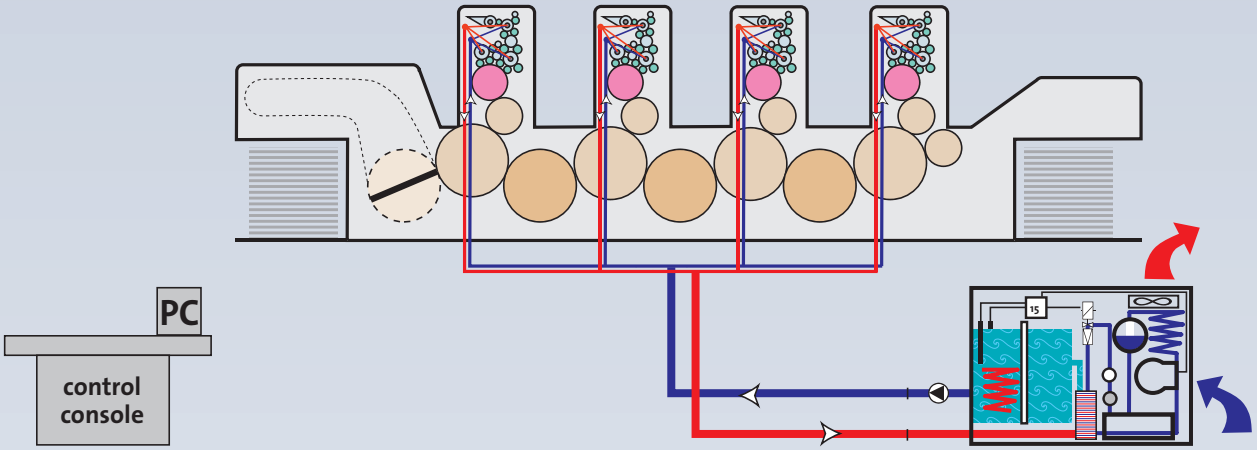


An Individual Tank Dampening Circulator has one separate circuit per dampening system (pan). Less contamination will take place, because the water from a specific dampening water circuit never is mixed with water from other circuits. This is an advantage for PMS and UV colors, while this advantage is less important for presses always running with the same 4 process colors.

An Individual Tank Dampening Water Circulator has one separate pump and cooling compressor per unit. This secures a constant and high flow through each pan, and the cooling compressor will react dynamically to fluctuations in heat generation from each individual unit, maintaining a consistent dampening water temperature during, idling, acceleration and printing for each unit, not depending on what happens in other units. This makes it easier to maintain a specific press temperature with a consistent ink/water balance.This system requires more space than a central tank system, and it is also more expensive.



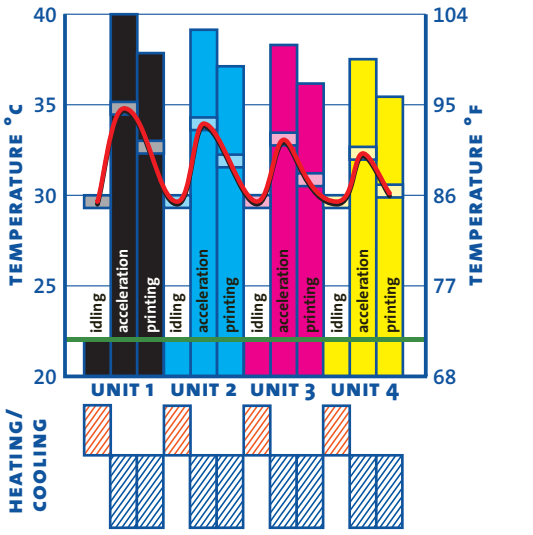
IRTC by remote cooling with integrated immersion heater



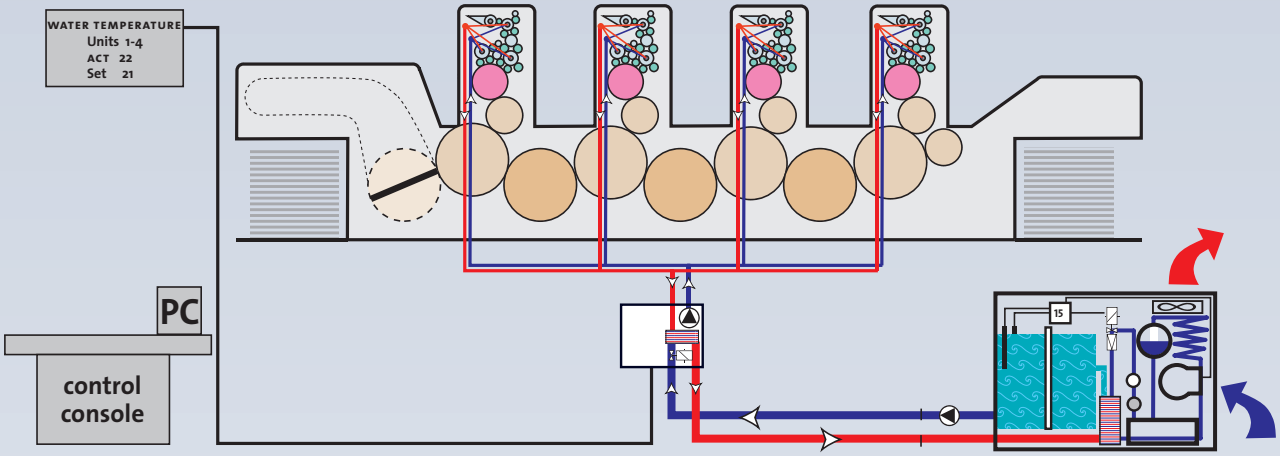
With a built-in immersion heater, the cooling system can operate with set-temperatures, which are significantly above room temperature. The system can consequently also be used to heat the press before starting to print. A cooling system with an immersion heater has one central circulation pump with a constant flow and can only operate at the chosen temperature level. It cannot adjust the cooling capacity to fluctuations in the heat generation.

The system will reduce the temperature fluctuations in relation to presses operating without cooling systems, but significant fluctuations in water, plate- and roller surface temperature will occur, especially during make-ready.

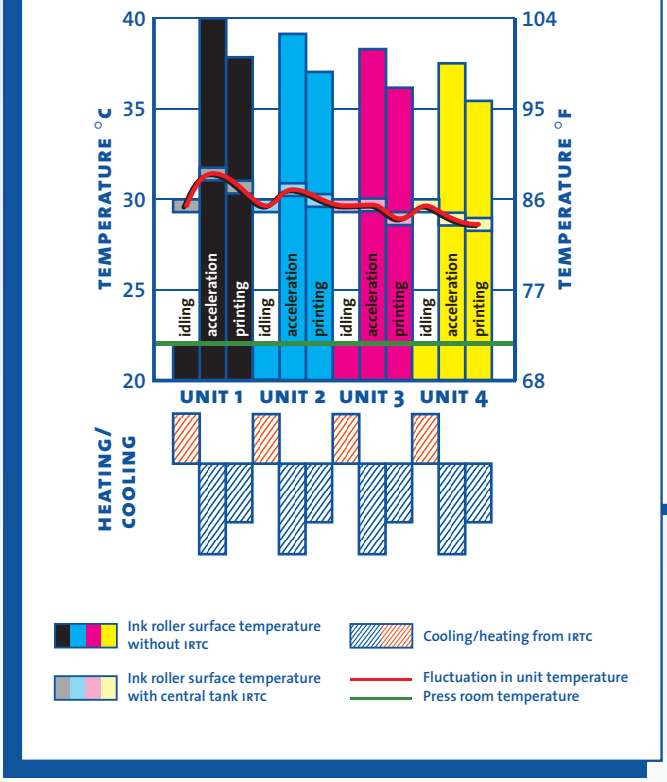
The system is ideal to maintain a consistent temperature during long run printing and prevent overheating.



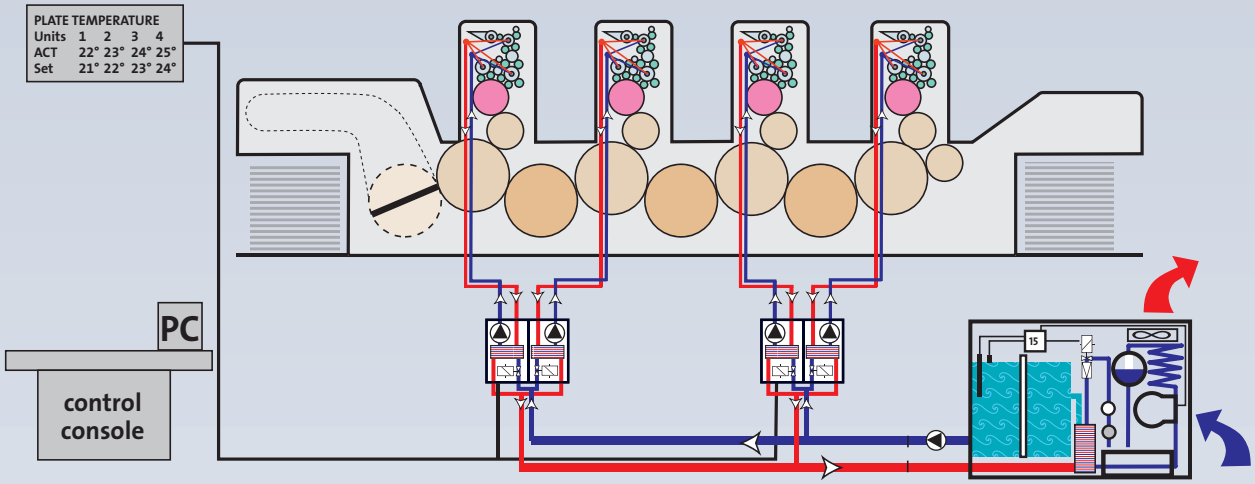
Single-zone IRTC with remote cooling



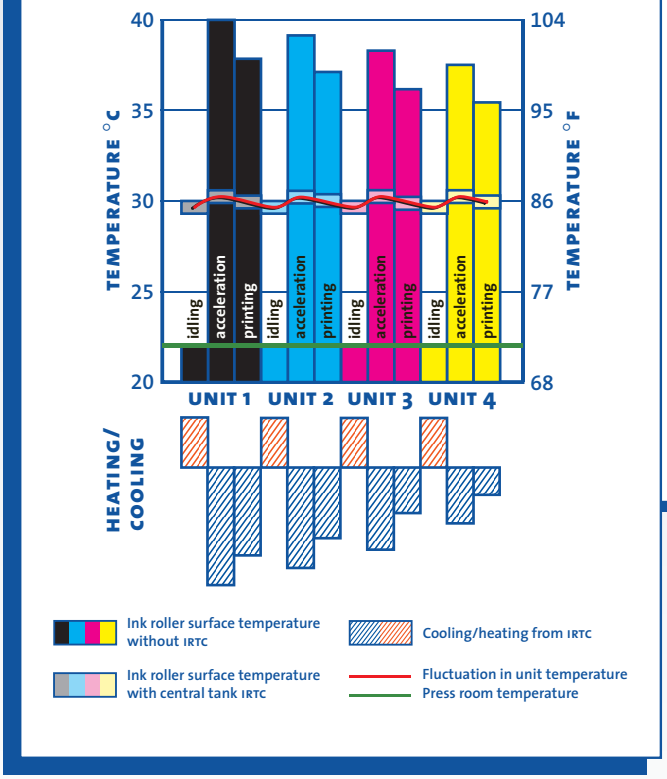
A Single-zone IRTC system has a closed circuit of water circulating between the press and the IRTC box. The flow in this circuit is fast and constant. A fast flow gives minimal temperature fluctuations across the rollers and a minimal difference between inlet and outlet water temperature. This gives the most efficient cooling (and heating). In the IRTC box the cooling water from the press "meets" the cooling water from the central cooler. The cooling valve will dynamically adjust the flow of cold water through the heat exchanger, so the cooling capacity is constantly adjusted to the heat generation. The different heat generations during idling (nothing) acceleration (a lot) and during printing (significant) is constantly absorbed. The single-zone system has only one central heat exchanger and circulation pump, so the cooling capacity is dynamically adjusted in relation to the average heat generation from all units. Consequently fluctuations in temperature between the units will occur, because the heat generation will fluctuate with the speed, kind of job and printing ink.This system helps to maintain a consistent temperature in the press during make-ready and printing and is suited for both short and long run printing. But it cannot prevent erratic temperature differences between the units.



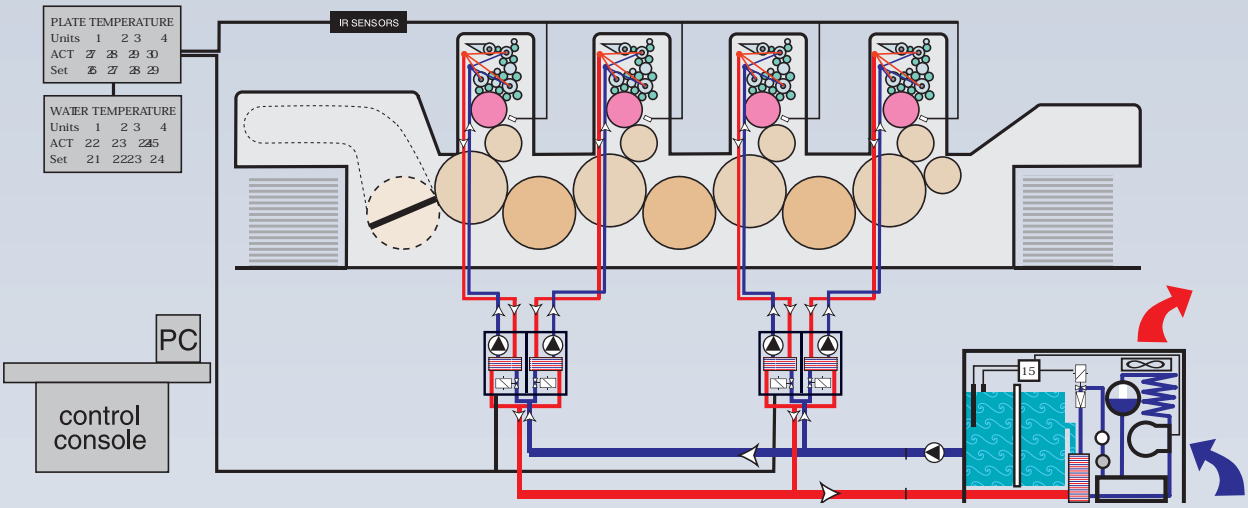
Multi-zone IRTC with remote cooling



A multi-zone IRTC system has one separate temperature circuit per printing unit. One pump, one heater and one heat exchanger will individually and dynamically adjust the temperature of each unit without an impact from other units.A high and constant flow through each unit will secure minimal temperature fluctuations across the rollers and in the unit. The system reacts immediately the fluctuations in heat generation based changes in speed or shifts from make-ready to printing. The system can even cool one unit, while it heats another.A multi-zone IRTC system is the only system capable of maintaining a constant water circulation temperature in each printing unit, even if the heat generation between the units fluctuate.The system is even capable of maintaining different temperatures in different units. This is a great advantage in connection with PMS colors, which are significantly more temperature sensitive than process colors.



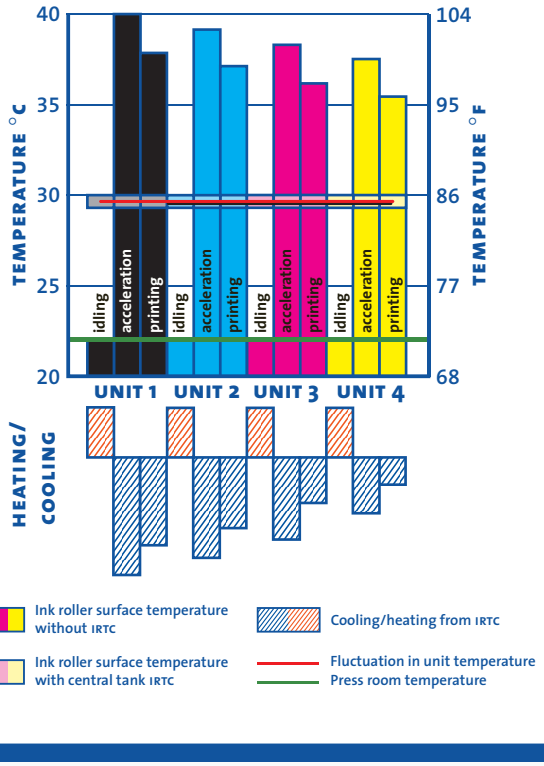
Multi-zone IRTC with IR sensors and remote cooling



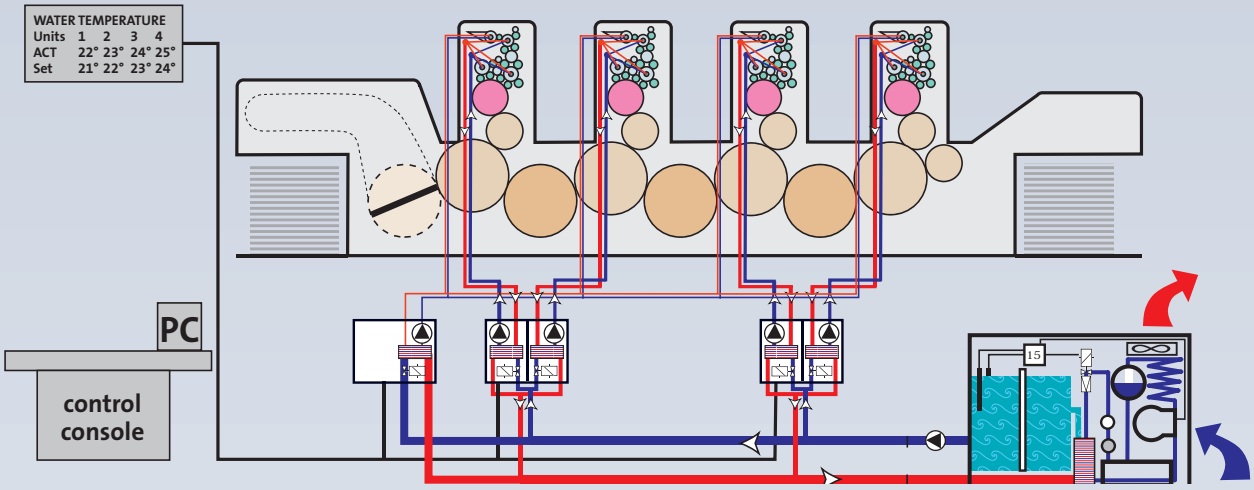
Multi-zone IRTC systems driven by IR sensors react slightly different to temperature fluctuations than Multi-zone IRTC systems without IR sensors. With IR sensors the system will react to fluctuations in the surface temperature of the measuring area on the rollers or plate. The surface temperature of a roller reacts much faster to temperature fluctuation than the inside of the roller, and therefore IR sensors give much faster reactions to fluctuations and a much better temperature control.

The faster reaction will also give a wider amplitude in the temperature fluctuations, and while a Multi-zone IRTC system will keep the temperature of the circulating water constant, the Multi-zone IRTC system will constantly fluctuate the water temperature to maintain a consistent surface temperature on rollers or plates.

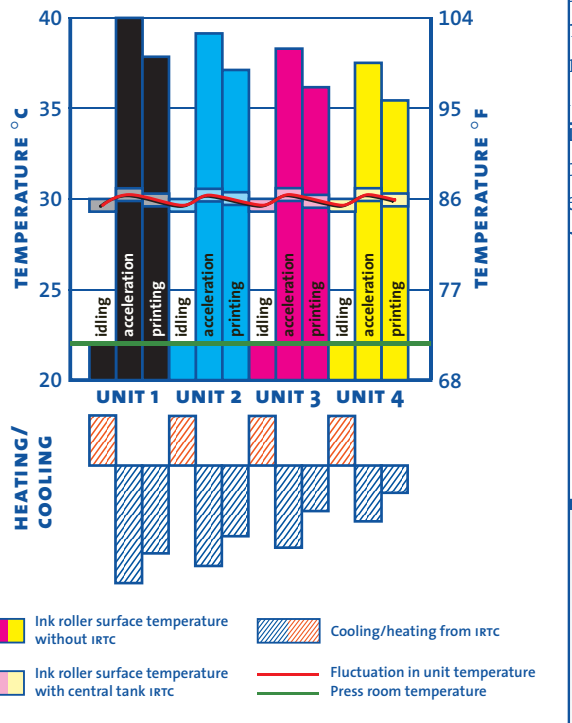
Having an IRTC system with much more fluctuations in the water temperature makes it even more important to have a separate circuit for ink fountain rollers.

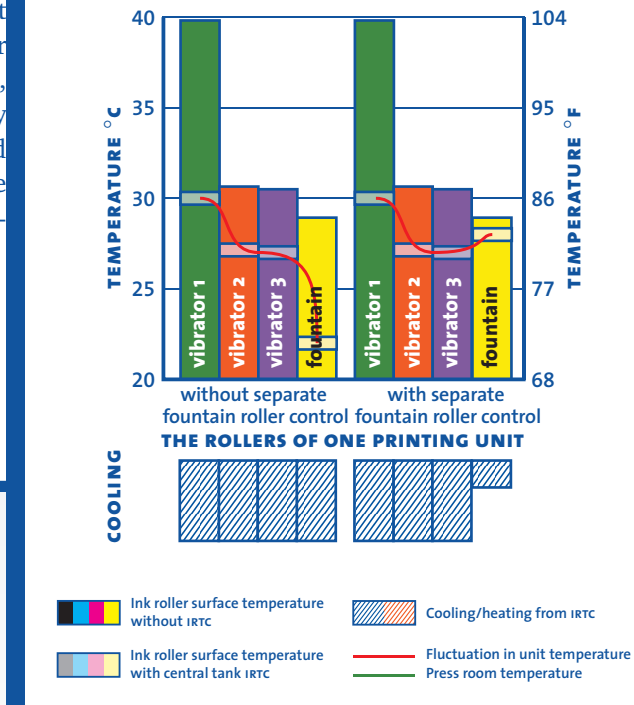


Multi-zone IRTC with remote cooling (Ink fountain roller in separate IRTC circuit)

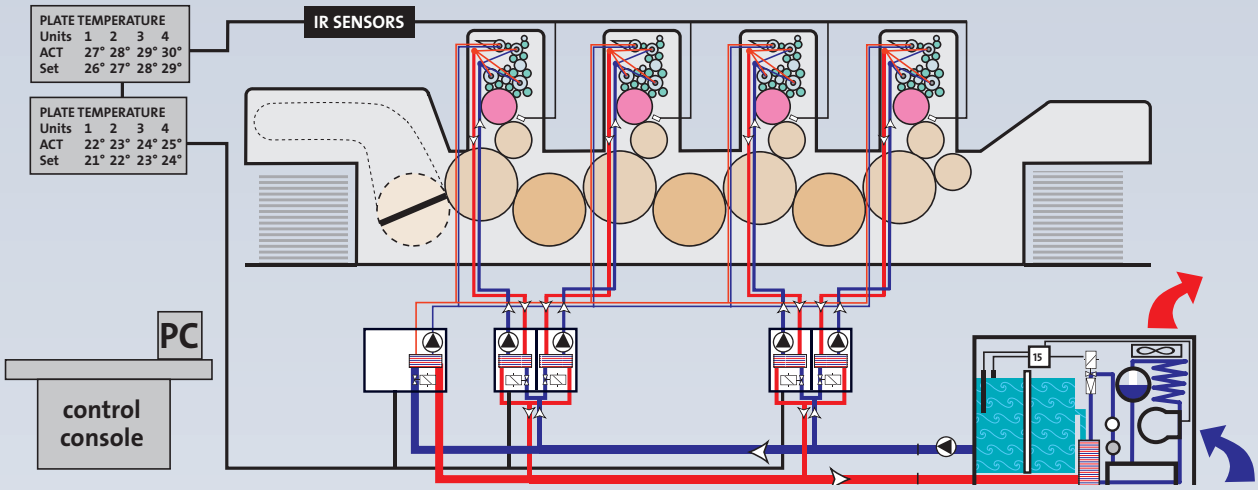


If the inking unit does not have temperature control of the fountain roller, the temperature of the fountain roller will fluctuate with the overall press heat generation. As the fountain roller is on the top of the printing unit and heat moves upwards, it will always be heated by the lower part of the printing unit.If the press has temperature control of the fountain roller, it is important to observe that the heat generations in vibrator and fountain rollers are different (this depends on the press construction). When a multi-zone IRTC system lowers the temperature of the cooling water to absorb an increased heat generation in the vibrator rollers, the same cold water will run through the fountain roller, if it is on the same circuit. With less heat generation its temperature will drop. This will dramatically violate the consistent flow out of the ink fountain. Modern CPT equipment and plate scanners are highly sensitive a correct flow of ink in the printing unit. The only way to obtain a consistent flow out of the ink fountain at a given ink key opening is to maintain a consistent ink viscosity. This can





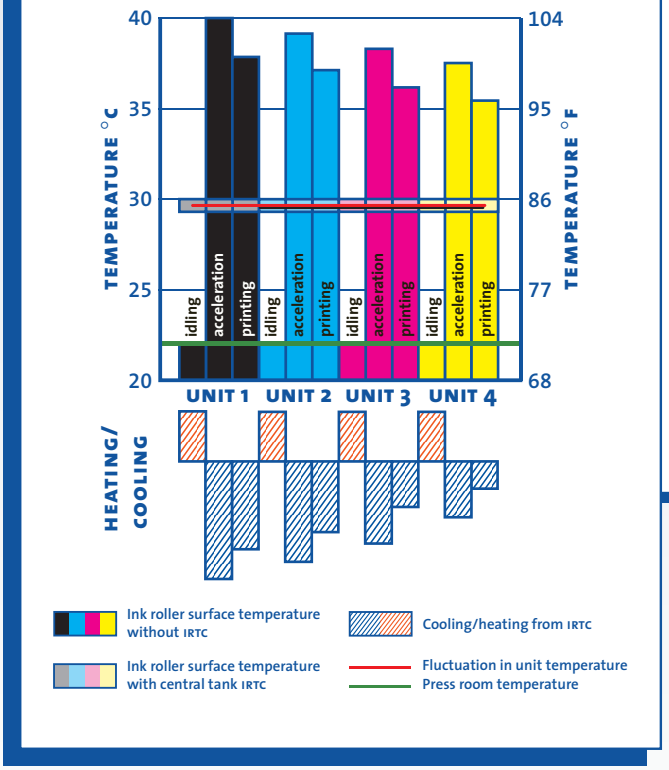
Multi-zone IRTC with IR sensors and remote cooling (Ink fountain roller in separate IRTC circuit)

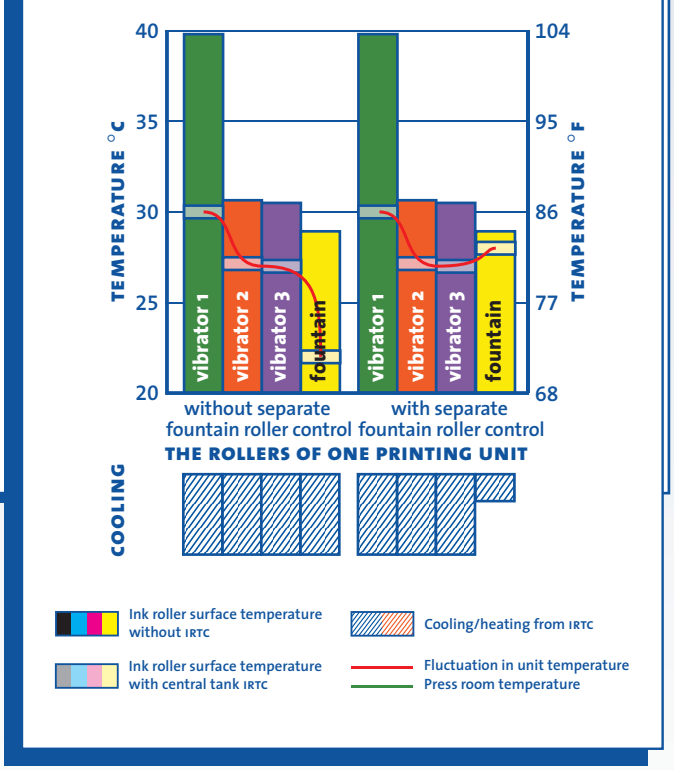


Multi-zone IRTC systems driven by IR sensors react slightly different to temperature fluctuations than Multi-zone IRTC systems without IR sensors. With IR sensors the system will react to fluctuations in the surface temperature of the measuring area on the rollers or plate. The surface temperature of a roller reacts much faster to temperature fluctuation than the inside of the roller, and therefore IR sensors give much faster reactions to fluctuations and a much better temperature control.

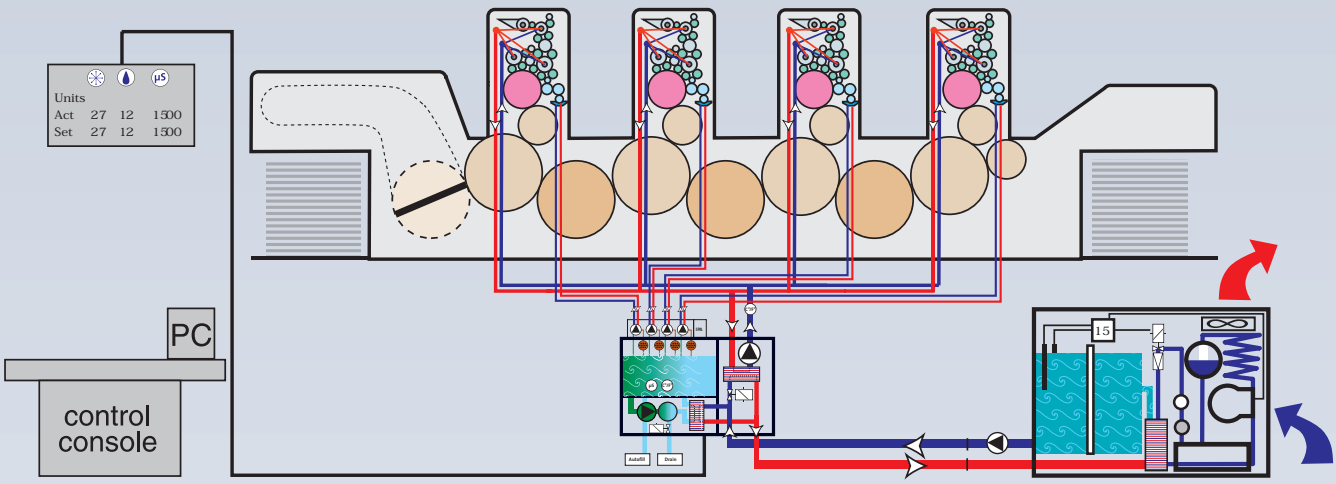
The faster reaction will also give a wider amplitude in the temperature fluctuations, and while a Multi-zone IRTC system will keep the temperature of the circulating water constant, the Multi-zone IRTC system will constantly fluctuate the water temperature to maintain a consistent surface temperature on rollers or plates.

Having an IRTC system with much more fluctuations in the water tem-



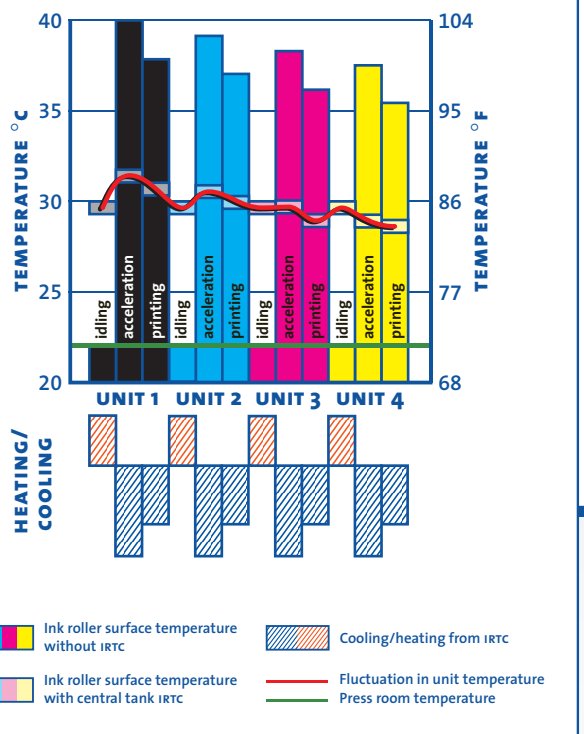


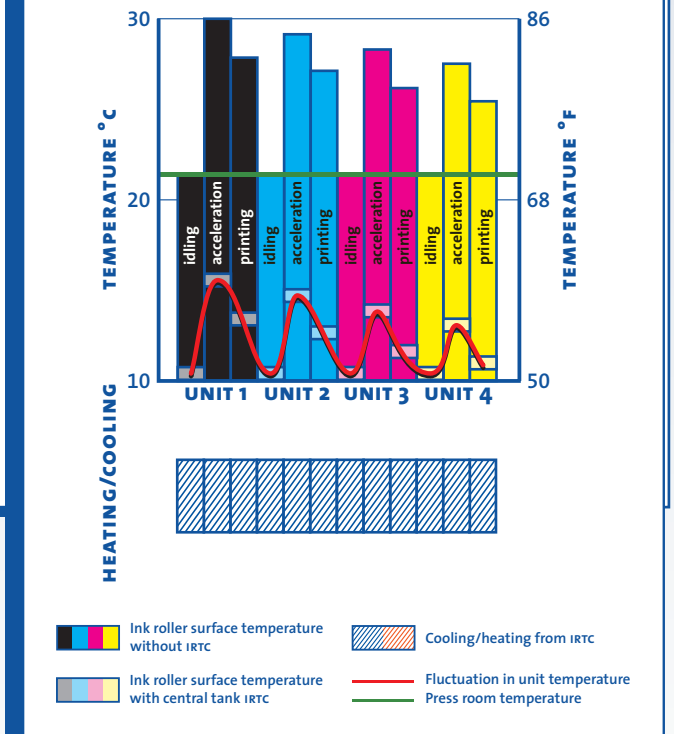
Single-zone Combi Systems with remote cooling



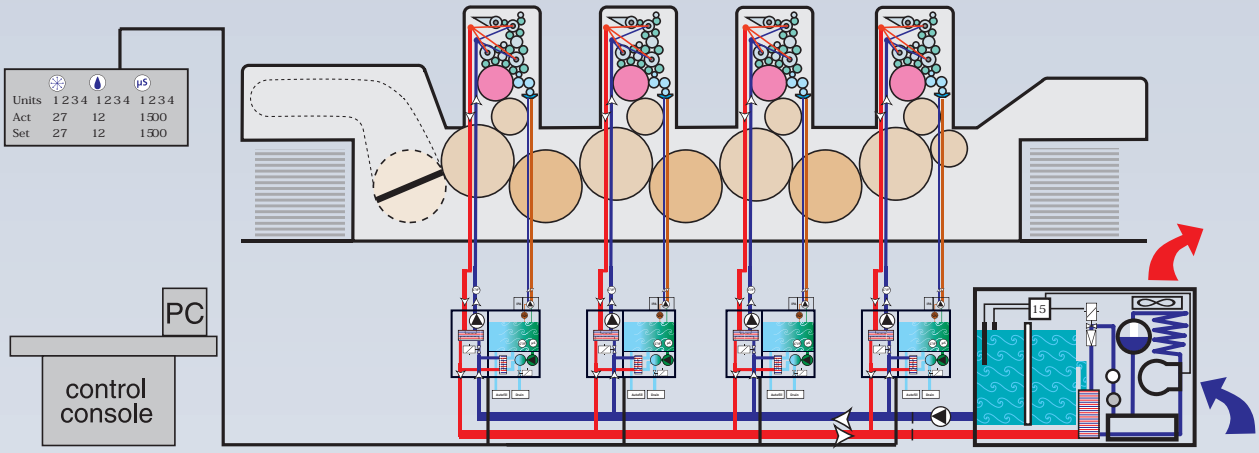
The Single-zone IRTC system reduces dramatically the temperature fluctuation in the press and also the fluctuations between the printing units. This makes the use of a Central Tank Dampening Water Circulator more acceptable.

The temperature of the dampening water will still fluctuate between the units, but much less than when using only a Central Remote Cooler or running the press without any kind of temperature control. Especially the capability of the Single-zone IRTC system to compensate for temperature fluctuation between idling, acceleration and printing will improve the ink water balance and printing quality.





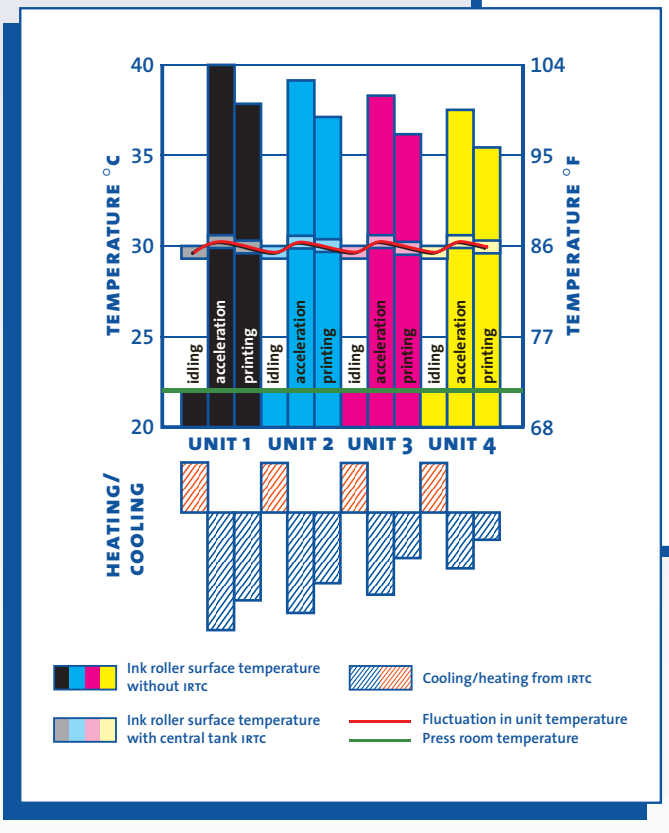
Multi-zone Combi Systems with remote cooling

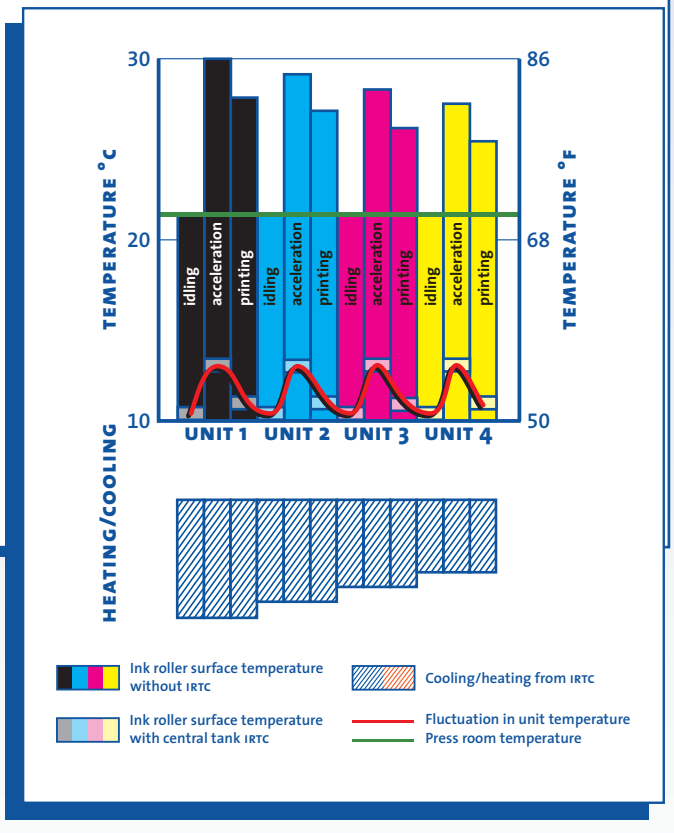


The combination of a Multi-zone IRTC system and Individual Tank dampening water circulators is in relation to both temperature and quality control a very sophisticated solution.

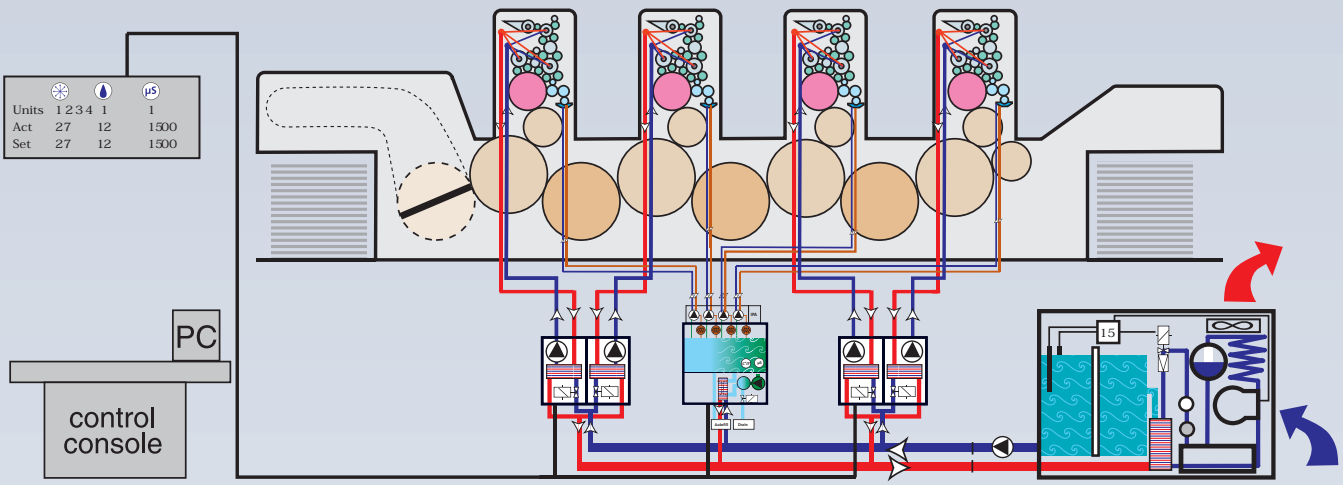
The Multi-zone IRTC system secures that temperature fluctuations in and between the printing units are kept at a minimum and the Individual Tank dampening water circulators secure that filtration and circulation are kept at the optimal level.

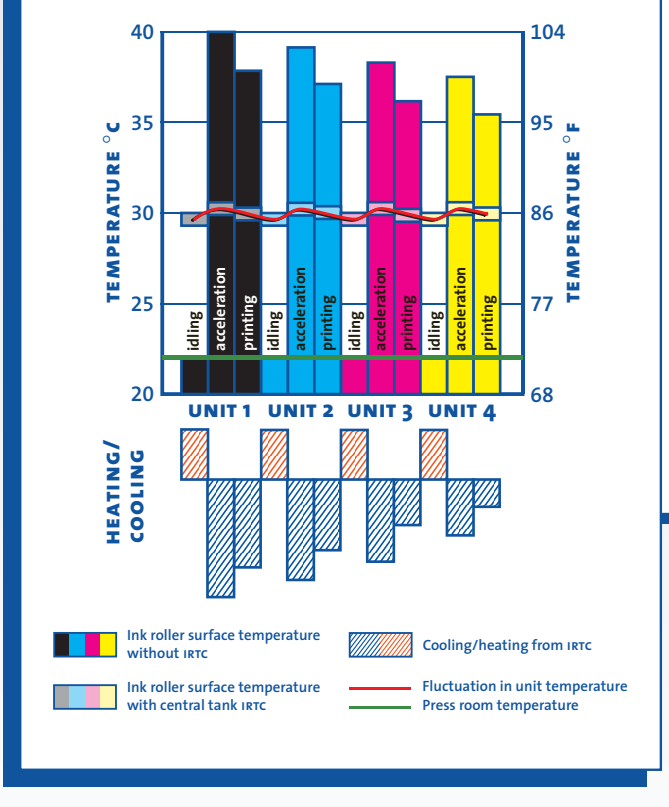
The combination of a consistent press temperature and consistent dampening water under all conditions will maintain a consistent ink/water balance and secure that fluctuations in printing quality and waste are kept at a minimum.

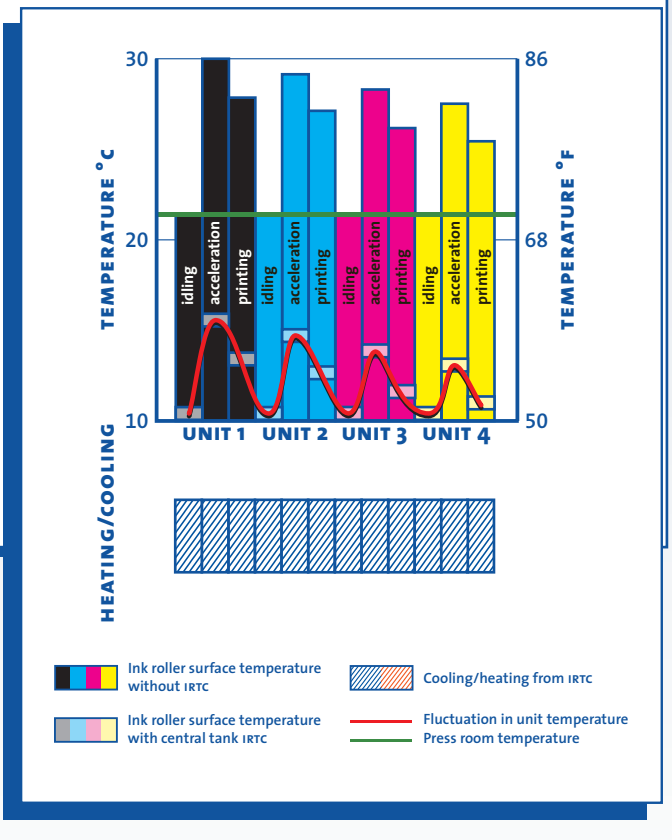




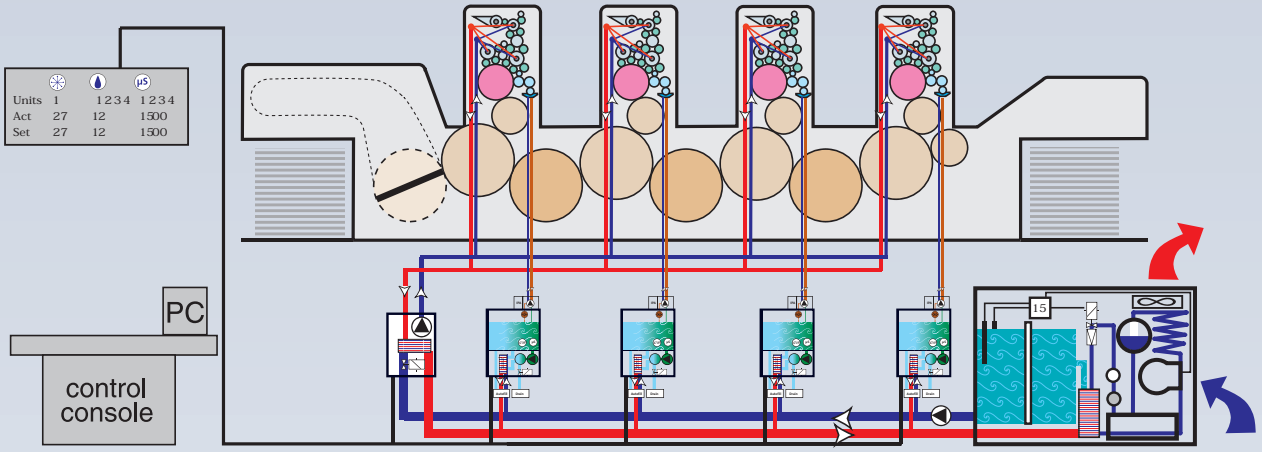
Single-tank DWC & Multi-zone IRTC with remote cooling

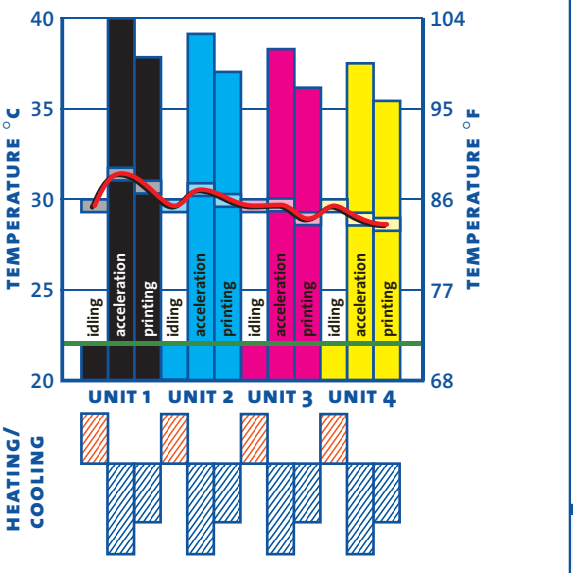


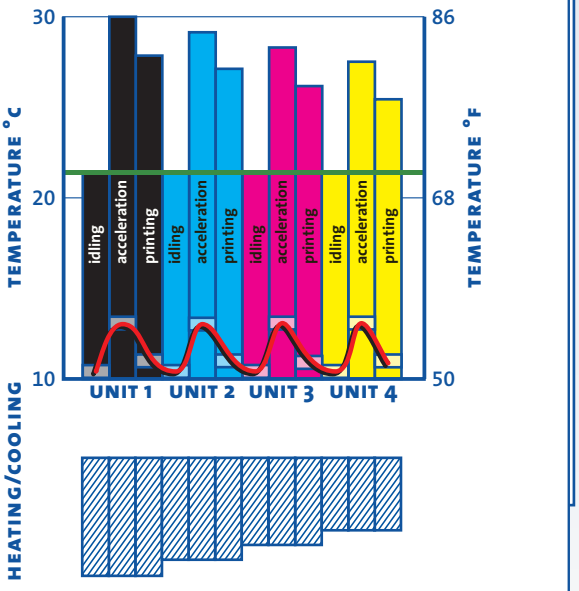




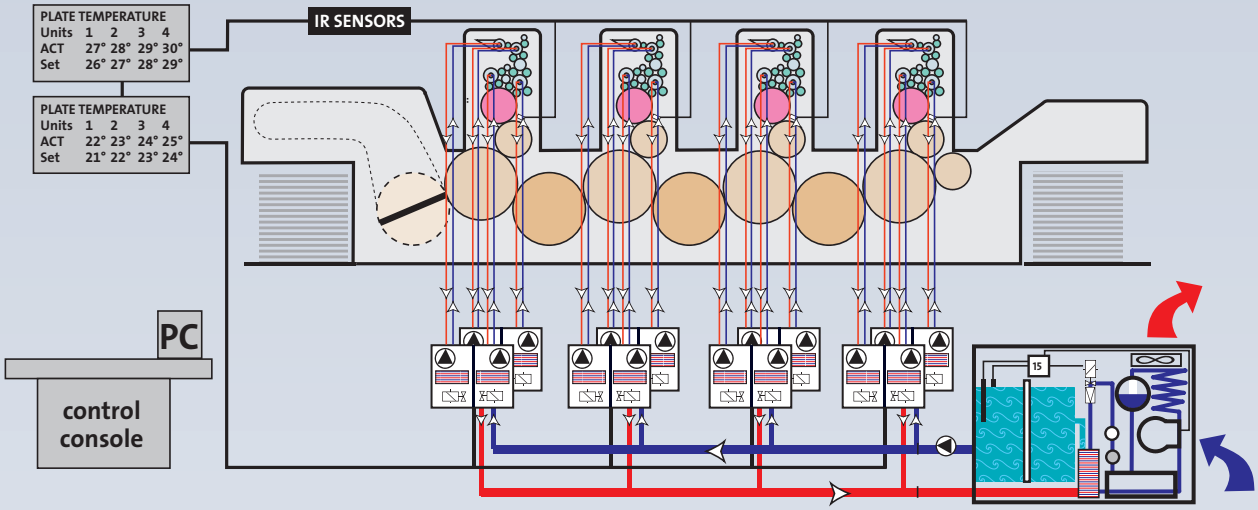
Multi-tank DWC & Single-zone IRTC with remote cooling







Total-zone IRTC with IR sensors and remote cooling



Multi-zone IRTC systems driven by IR sensors react slightly different to temperature fluctuations than Multi-zone IRTC systems without IR sensors. With IR sensors the system will react to fluctuations in the surface temperature of the measuring area on the rollers or plate. The surface temperature of a roller reacts much faster to temperature fluctuation than the inside of the roller, and therefore IR sensors give much faster reactions to fluctuations and a much better temperature control.

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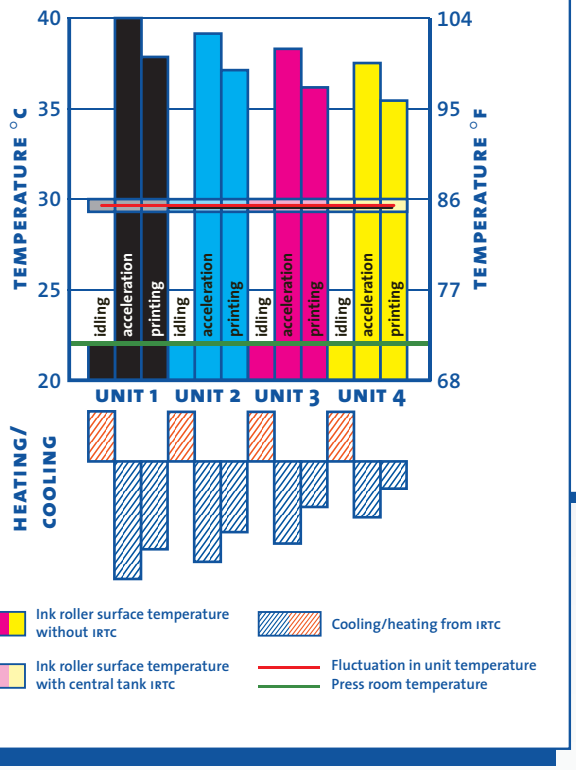
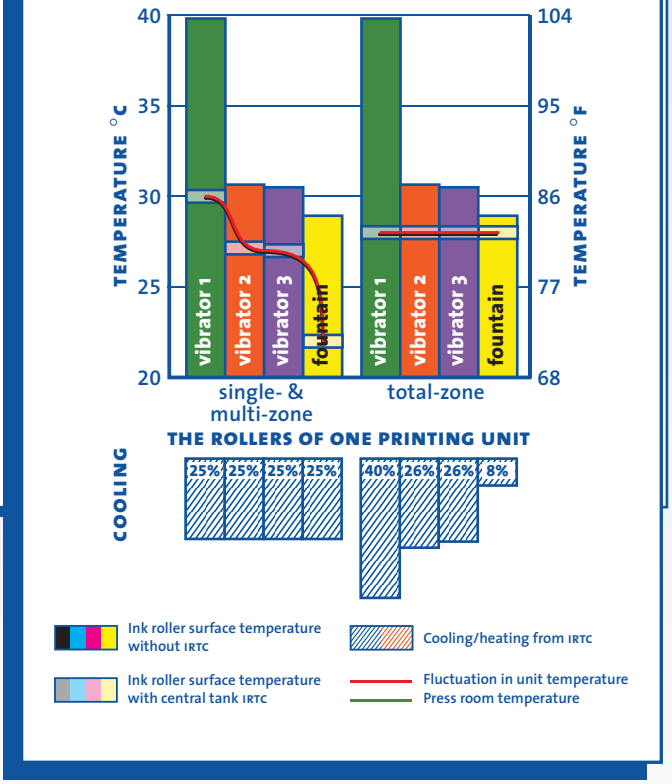




Temperature control of offset presses

All offset presses generate heat during printing. Energy is required to make the cylinders and rollers accelerate and maintain their rotations, and frictions from gears, cylinders, rollers and the tack from the inks must be overcome. Some energy is also used to accelerate the sheets from 0 on the feed board to up to 5m/s (15f/s) travelling though the press and brake them to 0 again in the delivery. It takes much more energy to accelerate cylinders and rollers than just maintaining them at a specific speed, and therefore the energy consumption during make-ready, which contains of a lot of starts and stops, is higher than during printing with a consistent speed. (Therefore we do not refer to make-ready, but acceleration).

The law of physics state that energy cannot disappear, but only be converted from one type to another. So when the main motor put energy into the press to move cylinders, gears and rollers and overcome frictions, this energy can only converted into heat, which is accumulated in the press. This heat can only be removed by external cooling sources: the air in the pressroom, cooling from dampening water, evaporation from dampening water and cooling the ink rollers.

The heat generation depends on the press construction and press speed. More and/or bigger cylinders mean more energy consumption during acceleration, and so does more rollers. More speed also requires more energy. More energy means more heat generation. This is the reason, why today's solid, high-speed presses require a good temperature control system.

4 different sources can perform press cooling:

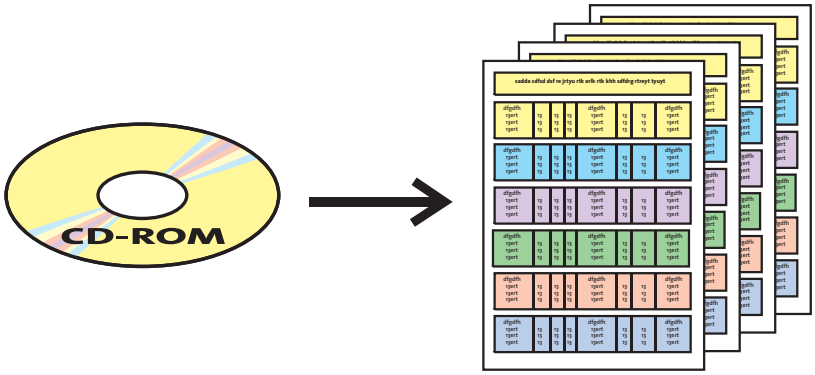
1) Air in the pressroom
2) Dampening water circulators (DWC)
3) Evaporating dampening water
4) Ink roller temperature controllers (IRTC)

The pressroom cooling capability depends on the room size, air circulation and inlet air temperature. The DWC can absorb around 15% of the generated heat. The evaporation of dampening water depends on the press speed and the difference between the press' and the dampening water's temperature, but evaporation can absorb around 20% of the heat generation. The maximum quantity of heat the IRTC can remove depends on the press configuration. A thumb rule is that in waterless offset up to 60% of the max rated power of the press main motor can be removed via the IRTC system, while it is around 40% in conventional wet offset.

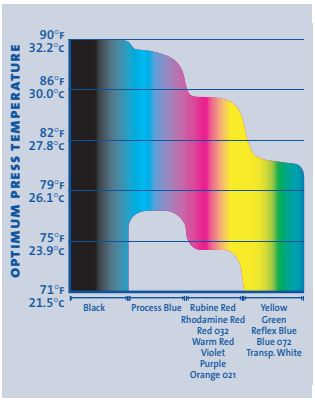
The real objective with temperature control is to maintain a consistent temperature in the printing process from start to finish of a print job. The underlying objective is to maintain a consistent ink dot and ink/water balance under all printing circumstances. DWC and IRTC systems can be cooled by integrated or remote coolers. As consistent pressroom temperature and relative humidity is fundamental for a consistent printing process, it is fundamental that as much heat as possible is removed from the press, before it can be absorbed by the pressroom air. Consequently it is important to remove as much heat as possible from the press with water cooling before this heat is absorbed by the pressroom air and exhaust far away from the press with coolers installed in remote areas – eventually outside the pressroom.

In the following are shown various configurations of DWC and IRCT systems and their impact on the temperature control of the offset press.

"A study by a leading press manufacturer shows that 88% of all fluctuations in printing quality are caused by variations in ink roller surface temperatures and ink/water balance."



Cool Graphics has developed a computer program, which makes it possible to evaluate the impact of IRTC systems under various conditions. Make ready times, running speeds, run lengths, material costs etc. can be adjusted to simulate various printing conditions. The program can be obtained by contacting Cool Graphics or its representatives.



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COOLGRAPHICS
ENERGY/ENVIRONMENT/PROCESS-CONTROL

Cool Graphics is a Danish company, which develops and manufactures dampening water premixers, ink roller temperature control systems and other ancillary equipment for offset presses to improve press performance, productivity and impact on the environment.

Cool Graphics markets and services its products in Europe through Royse Europe ApS, which is a joint venture between Royse Manufacturing Company and Cool Graphics ApS. In the USA Cool Graphics' products are marketed and serviced through Royse Manufacturing Company in Dallas, Texas, USA. In Japan and the Far East, Cosmotech Co. Ltd. represents both Royse Manufacturing Company and Cool Graphics.

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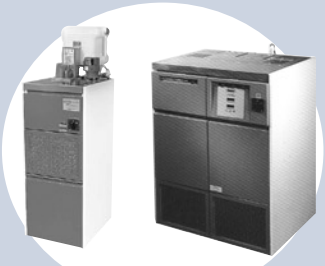

Royse's dampening water circulators (DWC) with individual and central tank configurations. Available with Classic supply pumps with return suction or with the new Clearwater technology with pre-filtration tanks

CG-Combi combination systems with Royse's DWCs and Cool Graphics IRTC systems. Available in small (S), medium (M) and large (L) sizes with Classic or Clearwater pumping/ filtration configurations. Available for most sheet- and web fed presses.

Royse coater circulators for 1) water based coatings 2) UV coatings 3) water based & UV coatings

Ecotemp and Digitemp single- and multi-zone ink roller temperizers.

Eco- and Digimix premixer systems use accurate doser pumps and a premixer tank to prepare highly consistent dampening water.