DryMaster™ Edge Drying

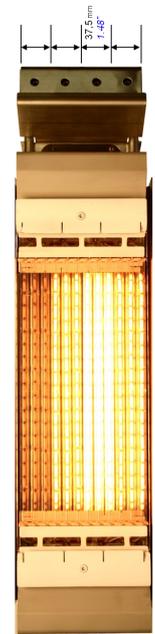**High speed CD and MD moisture control for increased production and quality with less energy**

ircon
DRYING SYSTEMS

Ircon Edge Dryer Control

Ircon have developed shortwave IR for many years and provides a control system specially adapted for this. The general idea with the control of the IR edge dyers is to reduce higher edge moisture together with moisture variations in CD and MD direction, as well as to minimise print mottle. Less variations lead to better coating pick up, better calandering result and a flatter sheet, as well as better printing result. The use of fixed temperature sensors allows quicker control actions. Quick control is especially helpful during grade changes, blade changes and after web breaks.

Some of the benefits in Ircon control system includes:

- Soft start to prevent in-current rush
- Constant load at variations in incoming voltage level
- Open for 380-690vac, 50/60Hz power feeding
- Narrow zones (37.5mm) to ensure excellent profiling as well as power savings
- Built-in web temperature measurement per zone making CD control of the web in less then 0.5sec.
- Quick power adjustment set from remote or receipt
- Easy change between Phase angle and pulse train control, both with half cycle control
- Deactivation of zones outside the web
- Automatic zone/lamp failure system
- Automatic immobilisation point detection
- Various running modes like energy minimisation

Some possible control strategies

Definition	Description	Used for	Advantage	Control by
CD-temp	The web temperature after IR dryers is measured by the TempArray sensors. The power in individual zones are adjusted automatically every second full width so the cross machine direction temperature is held at setpoint value.	Used to adjust the drying so it compensates temperature changes in cross and machine direction caused by variation in moisture, coat weigh, solid content and grammage.	Automatic quick drying control of cross direction and average IR power to reduce variations and improve quality with little or no operator interference. Also used to minimise binder migration in CD direction of the web (mottled print)	Ircon temperature control
MD-temp	The web temperature after IR dryers are measured by the TempArray sensors. The power in all zones are adjusted automatically so the machine direction temperature is held at setpoint value.	Used to adjust the drying so it compensates temperature changes caused by variation in moisture, coati weigh, solid content and grammage.	Automatic quick drying control of average IR power to reduce variations and improve quality with little or no operator interference. Also used to minimise binder migration (mottled print)	Ircon temperature control
MD-setpoint	Average setpoint value are sent by the QCS. QCS calculates power setpoint based on moisture average and send this power setpoint to Ircon. Ircon adjust power in all zones accordingly.	Used to adjust the average moisture at the scanner position	Allows control of the average moisture by using the IR dryers. This control is usually quicker that using air or cylinders.	QCS MD moisture control
CD- setpoint	CD zone power values are sent by the QCS. QCS calculates power setpoint for each zone based on moisture at scanner and transfer the setpoint to Ircon. Ircon adjust power in each individual zone accordingly.	Used to adjust (reduce deviation) of the CD moisture profile at the scanner position	Improved profiles will improve coating pickup as well as final quality at reel (flatness, gloss etc).	QCS CD moisture control
MD-moist	Average moisture value are sent by the QCS. QCS sends a moisture average value to Ircon. Ircon calculates power setpoint and apply the setpoint to the IR zones (same power to all zones added or deducted). A manual power profile can be entered.	Used to adjust the average moisture at the scanner position	Allows control of the average moisture by using the IR dryers. This control is usually quicker that using air or cylinders.	Ircon moisture control
CD-moist	CD moisture values are sent by the QCS. QCS sends cross direction moisture values to Ircon. Ircon calculates power setpoint and apply the setpoint to the IR zones (individual power to every zone).	Used to adjust (reduce deviation) of the CD moisture profile at the scanner position	Improved profiles will improve coating pickup as well as final quality at reel (flatness, gloss etc).	Ircon moisture control
Moisture-Temperature Cascade	Cascaded control. Power setpoint or moisture information from QCS can be used to adjust temperature set-point. Power setpoint can be either MD (one for all zones) or CD (one for every zone)	Improved (quicker) control than is normally achieved by using QCS scanner only.	Allows adjustment of moisture level at scanner, combined with quick control actions every 2-3 second.	Ircon moisture & temperature control
Baseload Energy minimisation mode Production maximisation mode Midrange	Power base load. An adjustable minimum power is applied to all zones. Energy minimisation: Some zones are always adjusted to zero power Production maximisation: Some zones are always operated at full power Midrange: Profiling is done with the average power at the same level at all times. If one zone is increase, other zones are compensated by decreasing power. Will not influence average moisture level.	To secure that a minimum drying always takes place. To avoid risk of "picking" caused by to little drying. To reduce risk of uneven shrinkage.	Reduced risk of wrinkles and "picking". Minimise energy consumption Maximize production	Ircon temperature control Ircon moisture control

Edge Dryer Control Setup

The important parts for a safe and reliable IR control are located in the IR frame and closeby electrical cabinets, these are always delivered from Ircon and include:

1. Several ICC2 (Integrated Control Cards) - one card for every IR module (up to four IR zones)
2. One FCC2 (Frame Control Card) for each station (up to three IR-frames)

Depending on customer demands there are an almost infinitely number of connections possible to control the system:

IRCON DRYMASTER™ CONTROL
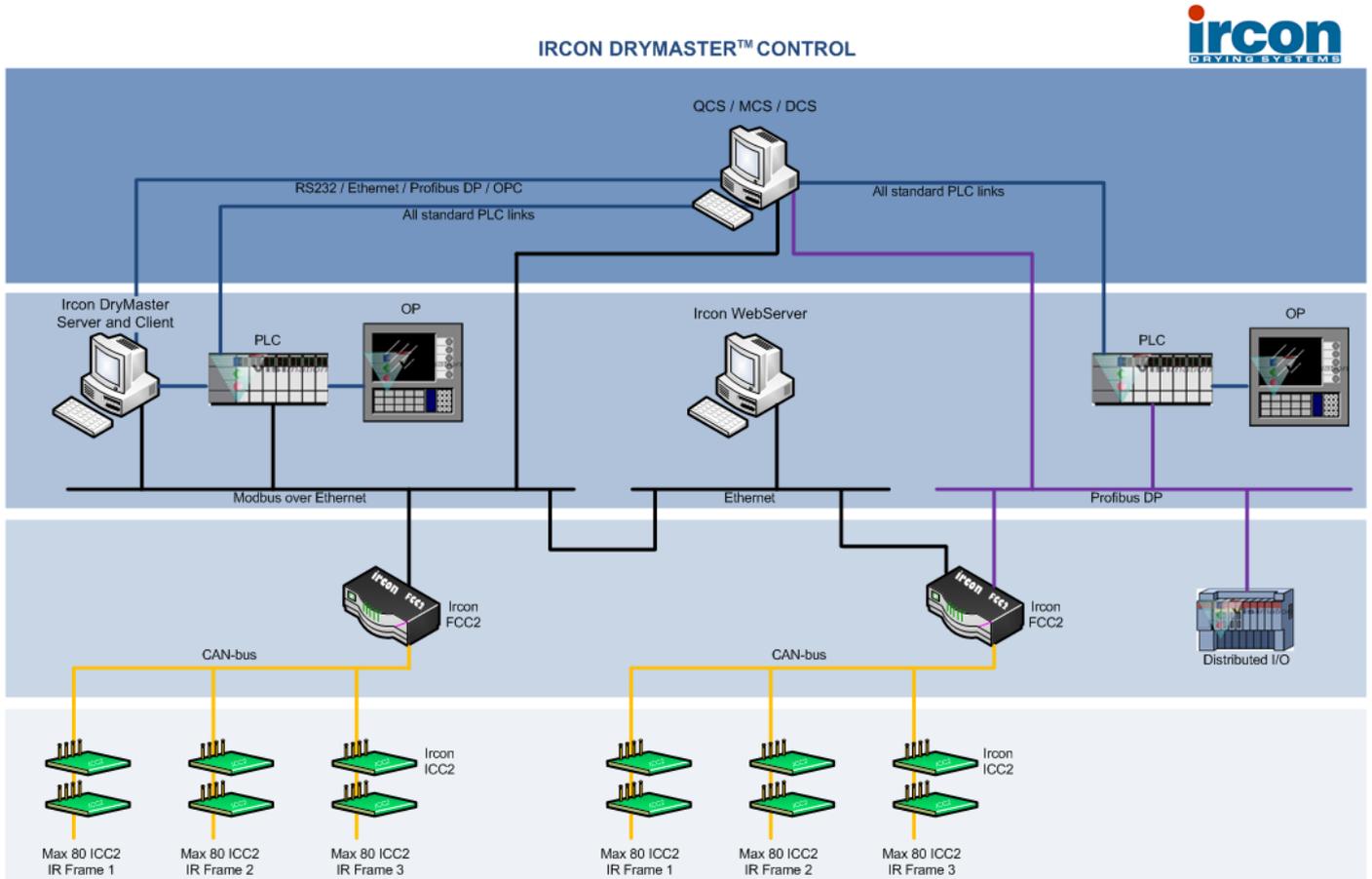
Connection to the FCC2 can be done in following ways:
1. Modbus over Ethernet, full functionality with all tags available
2. Modbus over Profibus, full functionality with all tags available
3. Profibus DP standard, limited functionality and tags available.
4. FCC2 built-in Web Server. Enables full monitoring of the IR-frames and includes system settings. No IR control from web server.
5. RS232. Mainly for software download. Not used for customer connection.

The specific type connection used in a project is based upon the control strategy of the customer. The most common alternatives are:
1. Ircon as stand alone system with OP screen. A Profibus DP or Modbus over Ethernet is connected to the PLC where all logic and control are made. The operator interface is done in any standard OP connected directly to the PLC.
   The PLC can also be connected in various ways to the machine control system for remote control
2. Ircon stand alone system. A PC including DryMaster Server and Client software communicates with the FCC2 card with Modbus over Ethernet. The PC is also connected to the PLC that handles the logic. The operator interface is done in the DryMaster Client software where the operator can start/stop the system, set power levels, see alarms etc. etc.
   The PC can also be connected in various ways to the machine control system for remote control, see "Remote control of DryMaster PC"
3. Ircon as totally integrated system in existing machine control system. The FCC2 card is connected via Profibus DP directly to MCS/QCS/DCS that handles all logic control as well as power settings towards scanner moisture etc.
   The Built-In WebServer is accessed from any PC connected over Ethernet to the FCC2 card. The WebServer gives the service personnel full knowledge of the IR system status without the need to program or transfer all this data to the MCS.
4. Ircon as totally integrated system in existing machine control system using OPC Server. The FCC2 card is connected via Modbus over Ethernet to a PC with DryMaster Server and OPC Server software. The MCS/QCS/DCS is then connected over OPC and handles all logic control as well as power settings towards scanner moisture etc. The OPC server includes all available tags in the DryMaster Control, see "Ircon DryMaster Software with OPC Server"

Remote control to Ircon PLC

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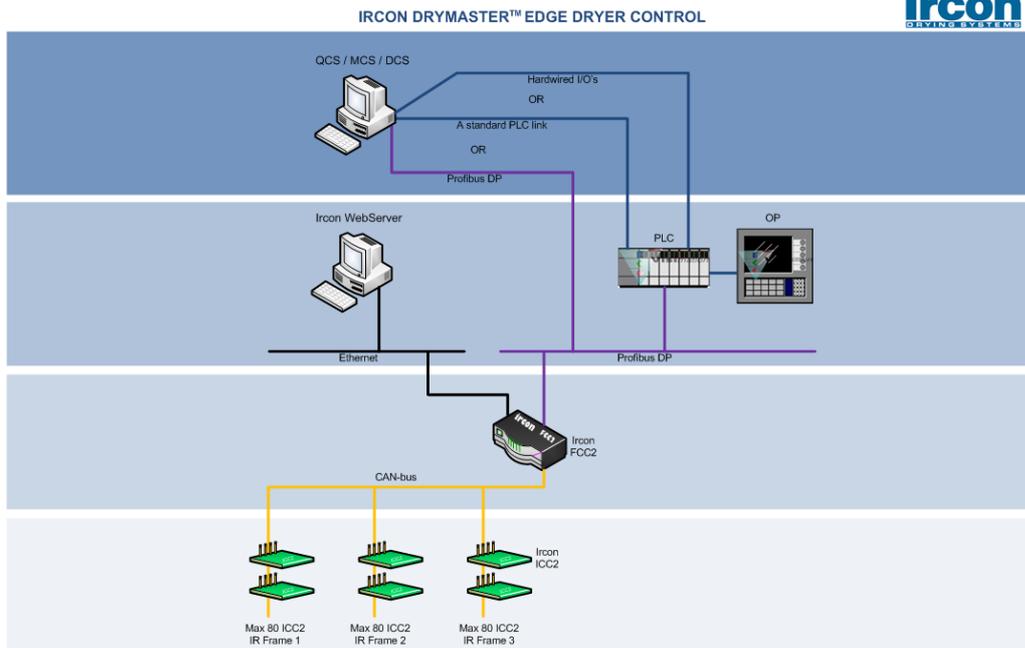
Depending on customer system there are a number of connections possible to the Ircon PLC, the most commonly used are over Profibus DP, Ethernet or hardwired as showed in the picture to the left. The data transferred in these links could be divided in a few major groups;

1. Scanner moisture profile is mapped and converted to a power setpoint profile/zone of IR dryer
2. Scanner moisture profile is sent directly to Ircon (option)
3. Scanner moisture profile is mapped and converted to a temperature setpoint profile/zone of IR dryer (Cascade control)
4. Single value control. The IR power is automatically controlled around an average value

Apart from the power setpoints a number of other signals could be exchanged like:

- Alarm and indications
- Control (start/stop)
- Recipes
- ES, Web break etc

Component Specification

The base in the DryMaster control system consists of some Ircon own developed components (FCC2-Frame Control Card, ICC2-Integrated Control Card, Ircon web server, DryMaster PC Software DryMaster Server / Client / OPC-server).

For the logic control and communication with machine systems Ircon work with a number of different suppliers depending on customer demands, these are normally in the Edge Dryer systems as follows:

- PLC. Allen-Bradley Compact Logix (Control Logix or SLC 5/04 at extra cost)
- PLC. Siemens S7-1200 system (S7-300 system at extra cost)
- PLC. Mitsubishi FX-3U (Q-system at extra cost)
- PLC. Binar BiFas 70.

- OP. Allen-Bradley PanelView Plus serie.
- OP. Siemens Simatic MP / TP touch panels
- OP. Mitsubishi E1000 serie.
- OP. Binar OP44.

Other panel manufacturer (i.e. Cuttler-Hammer) on request.

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