# Using CALgrafix on Plastic Extruders

CAL Controls

Application

Plastics Extruders have a number of temperature zones (six plus collar and head in the example shown) that are critical to ensure the end product is produced at the right quality as quickly as possible. Each of the temperature controllers shown below control the temperature at each zone as the extrusion is being formed. The controllers apply heat or cooling as required so that set-point temperature can be reached then maintained. The extruder screw speed is controlled by a variable speed drive; an encoder or transducer provides feedback so that constant speed is achieved. A pressure transducer can also provide indication to when a blockage exists due to hardened polymer, hence avoiding damage to the screw, gearbox and motor.

Controller outputs for cooling fan in each zone

CAL PROCESS CONTROLLER

CAL TEMPERATURE CONTROLLERS

Hopper

SOLID STATE RELAYS

Pressure Transducer

Motor for extruder screw

HEATERS

Zone 1   Zone 2   Zone 3   Zone 4   Zone 5   Zone 6   collar   head

Temperature Sensors

Transducer or encoder

Variable Speed Drive

COOLING FANS
individually controlled by process controllers

RS485 Comms

RS485 Comms

PC or HMI with CALgrafix and OPC server for variable speed drive

Each of the processes detailed above are all working in isolation to each other. By using CALgrafix all the main components can be networked hence creating a system that can be monitored centrally.
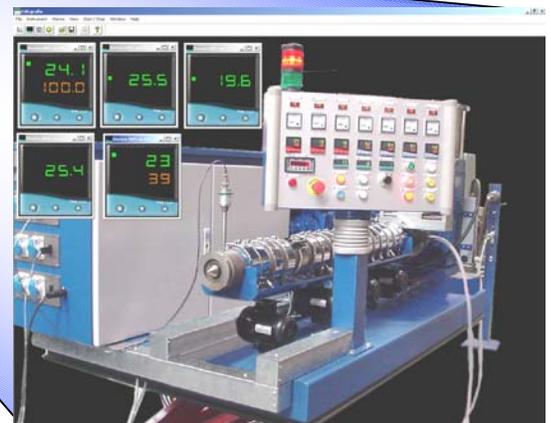
CALgrafix – Networking and OPC

CAL Controls

CALgrafix is an OPC based product that incorporates charting, logging, controller configuration and alarm functions within a single easy to use Windows™ based package.

What is OPC?

OPC is an interfacing standard based on Microsoft®'s OLE/DCOM technology. What this means, is that a standard has been developed for interfacing between networks of instrumentation or control devices and software based applications. In the past, software developers had to create a specific device driver for a device to run with their application, therefore, one device may have a number of drivers written by producers of different applications.

In **Fig 1**, it can be seen that for the applications running, four different drivers are required to interface with the device networks. In some cases conflicts will occur as two drivers try to access a network at the same time. If further applications were added from another manufacturer then additional drivers would be required, creating a much more complex system leading to an increased possibility of incompatibility problems.
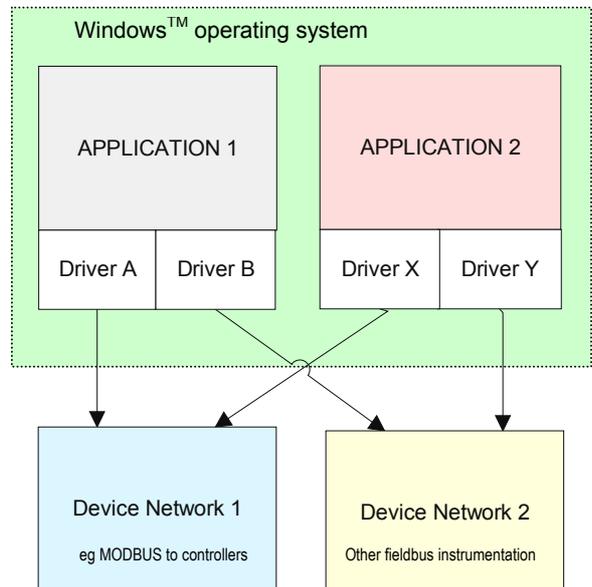

Fig 1 – Non OPC based network

OPC technology eliminates the need for different drivers for the same device network. Many software applications are now written to comply with the OPC standard and are referred to as OPC based clients. The software link between the device networks and OPC based clients is known as an OPC server. The OPC server is generally specific to one device or a range of devices from a single manufacturer but they differ from other drivers, as they allow connection of device networks to any OPC based client.

In **Fig 2**, it can be seen that for the two applications running, that only two OPC servers are required to interface with the device networks. If additional OPC clients are required, no additional servers are needed. The result is a simpler system with compatibility that is assured.
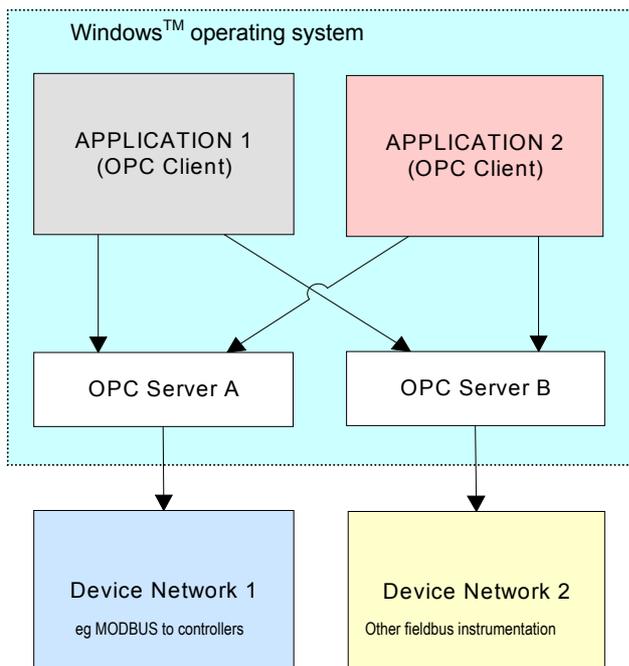

Fig 2 –OPC network example

What are the advantages of OPC?

➢ *You can choose the best client that suits your process.*

➢ *A number of clients can be run on a PC network accessing any OPC server without software conflicts occurring.*

➢ *A single client can access a number of OPC servers, thus increasing the number of networked devices/instruments*

Overall OPC provides improved connectivity and networking options at a reduced cost

Further information on OPC is available from the OPC Foundation website at www.opcfoundation.org

Clients and servers are not restricted to a single PC or HMI. Clients running on different PC's can access the same OPC server across a PC network using DCOM.
An example is shown in **Fig 3**.
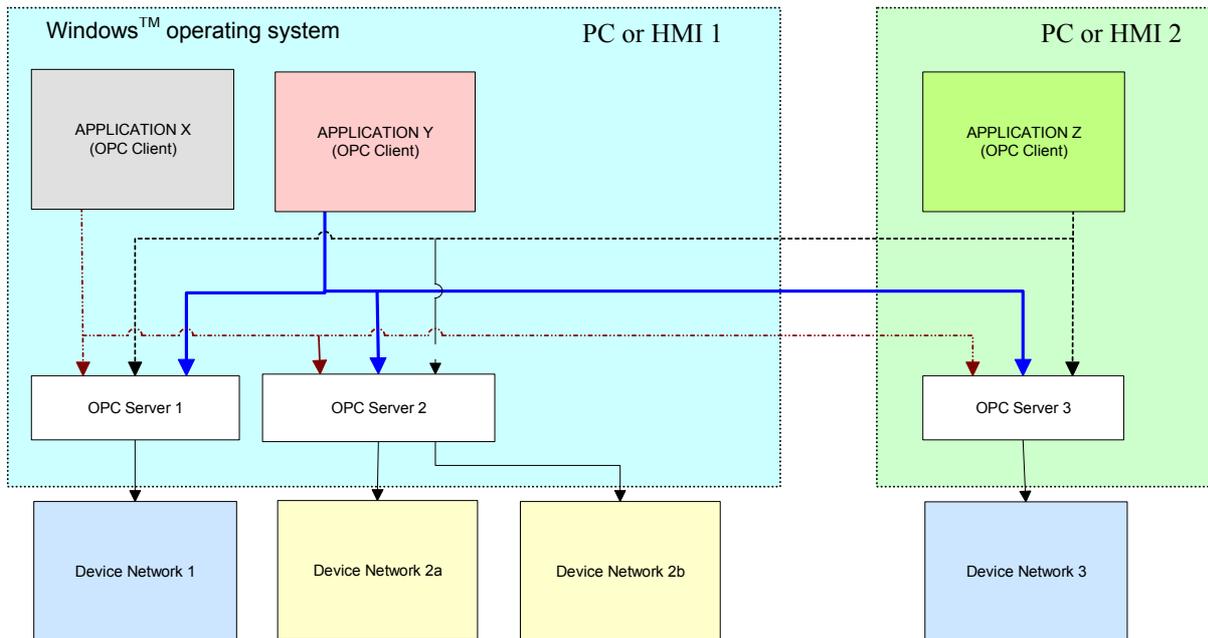
Fig 3

CALgrafix and OPC Licenses

CALgrafix Standard

CALgrafix standard incorporates a single user license that allows connection to a single RS485 network of up to 128 controllers. Standard version is compatible with CAL's 33/93/9400 and 9500P ranges of temperature and process controllers.

No additional controller networks, third party product networks or CALgrafix clients can be added.

CALgrafix Professional

CALgrafix professional incorporates a Calgrafix client license and a CALopc server license that permits connection to multiple RS485 networks of up to 128 controllers. Additional distributed controller networks can be added by purchasing additional CALopc server licenses. Third party OPC servers can also be added to work in conjunction with CALgrafix

CALopc

A CALopc server license allows a network of CAL's temperature or process controllers to connect to third party clients or additional networks of controllers when used with CALgrafix professional.

CALgrafix Client

The CALgrafix Client license can access CAL OPC servers or third party OPC servers .

	License includes		Additional Licenses		
	CALgrafix Client	CALopc server	CALgrafix Client	CALopc server	3rd Party OPC server
CALgrafix Standard	1	1	No	No	No
CALgrafix Professional	1	1	Yes	Yes	Yes
CALgrafix Client	1	0	Yes	Yes	Yes
CALopc server	0	1			

Further information on OPC is available from the OPC Foundation website at www.opcfoundation.org

Benefits of using CALgrafix

- **REDUCED SET UP TIME**
- **PROCESS DATA FOR QUALITY MONITORING**
- **ALARM NOTIFICATION**
- **INTEGRATION TO OTHER PLANT**

Settings for polymer temperature in each zone and pressure within the extruder can all be controlled from a PC, this provides time saving on commissioning, changing to different materials or extruding other products.
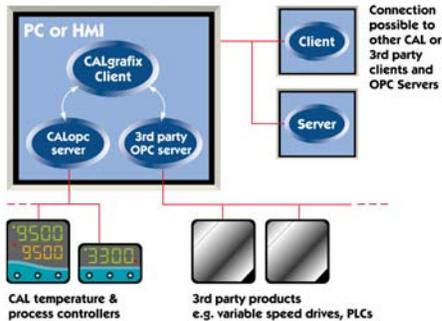
CALgrafix is an OPC (OLE for process control) based software product, which is an open standard for networking process control products. This means ,third party hardware (in this case, a variable speed drive) that has an OPC server can be networked with CAL controllers to create an integrated system.

Other OPC clients such as SCADA providing plant-wide monitoring can access devices via the OPC servers, in addition to CALgrafix

An application note on OPC is available on request.

Providing data for quality control purposes can also be achieved with CALgrafix. Charting functions allow plotting of process values over a specified timescale. This data can also be exported to other applications such as Excel™.
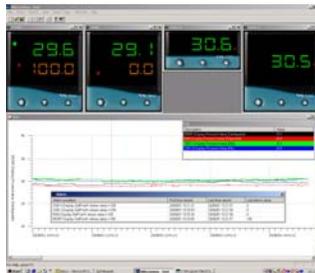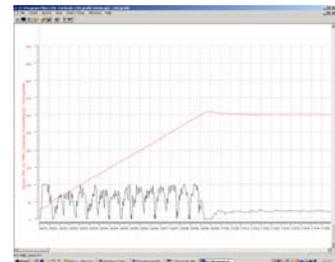
Alarm Notification

Data Chart

Visual and audible alarms notification can be set, to assist in reducing response time to alarms. Alarms can be set for all measured and set parameters. During an alarm condition display priority is given to alarm notification window and an audible alarm signal can be set.

Notes

Exothermic reaction – Often with extruders, temperature build up is a problem due to continued pressure and operation in certain zones along the barrel. This high temperature is often higher than set-point such that cooling becomes essential. CAL's controllers have heat-cool strategy that makes fine tuning much easier.

Speed Monitoring - Closed-loop control of the screw speed is normally controlled by the variable speed drive. It is possible to monitor, chart and record screw speed and also monitor current. CALgrafix can do this via MODBUS RTU, OPC V2 Server (from the variable speed drive supplier) or analogue signals fed into a CAL 9500P controller.

For further information on CALgrafix in relation to your application, contact our sales office below.