

THE TPC ESSENTIALS MODULE

With the innovative design of the Temperature Process Control (TPC) System, it is now possible to optimize the extrusion process with a systematic approach to define, implement, and evaluate Best Practices Standards at the press. With accurate and efficient management of process temperatures, the TPC System can dramatically improve productivity, quality, and the consistency of performance with each order and each shift. The foundation of the system is the TPC Essentials Module which includes the following important features:

The Essentials Control Module: The closed loop control system accurately and continuously coordinates all of the required adjustments to automatically maintain the optimal process temperatures over a wide range of operating conditions at the press. Unlike speed and pressure based control systems, the TPC System uses live temperature inputs and a learning based architecture to continuously tune billet feed temperatures, pressures, speeds, and profile temperatures at the exit of the press so that extrusion times are reduced and consistent quality is maintained.

The Essentials Recipe Database and Reports: With the die recipe database, live graphical views, and detailed reports, the operators no longer need to be thermal management experts to run the press to Best Practices standards, and engineering and management now has the information it needs to make informed decisions about optimal recipe values, problems at the press, and investments in process improvements.

A SYSTEM FOR CONTINUOUS PROCESS IMPROVEMENT

The **Operator Console of the TPC System** is organized into four sections which make it easy to manage orders, analyze process data, and update recipes with optimal values.

OPTIMIZING THE EXTRUSION PROCESS


- Increase press speeds by 10%-20% upon commissioning the system. Many users double these improvements as recipe values are optimized.
- Improve product quality with better surface finish, fewer defects, and reduced scrap rates by 2% - 5%.
- More consistent press performance as each operator runs the press using the optimized TPC recipes.
- Improve production scheduling with more consistent and efficient performance 24 hours a day, 7 days a week.
- Make informed decisions about process improvements with TPC's detailed process and production data.
- Reduce press downtime with TPC's live graphical views and alerts that enable operators to proactively manage abnormal operating conditions at the press.
- Additional press capacity can be used to process more orders or provide greater flexibility with scheduling orders.

-Operating Parameters-		
	ACTUAL SET POINT	CURRENT BILLET
Profile Temperature (°F)	990	989
Quench Rate (°F/s)	5	6
Die Temperature (°F)	775	790
Billet Temperature (°F)	850	830
Extrusion Ram Speed (in/s)	20	20.5

1. On each billet, **key process parameters** are monitored and adjusted to the specified recipe values enabling more consistent operation of the press by each operator on each shift.

-Control Monitor-

	CONTROL STATUS	OFFSET LIMIT	ACTUAL OFFSET
Dynamic Speed (%)	ON	10	10
Step Speed (%)	ON	10	9
Total Speed Offset (%)			19
Front Billet Temp. Offset (°F)	ON	20	-20
Rear Billet Temp. Offset (°F)		10	
Nitrogen Output (%)	OFF	50	0



2. The **closed loop control system** continuously and automatically adjusts the press speed and billet feed temperatures to optimize breakthrough times, maximize pressure, and maintain optimal profile temperatures at the exit of the press.

Process Data	
Peak Pressure (psi)	2790
Break Through Time (s)	3.5
Average Profile Temp. (°F)	975
T/C Billet Temp. (°F)	825
Current Extrusion /Contact Time (s)	78
Current Dead Time (s)	15

3. **Critical process data** is displayed for each billet on the operator console and more extensive data is saved for each billet and order in the advanced system reports.

Order Summary	
Current Die	SZ358/12
Extruded Billets (nr)	32
Next Die	A-282/8
CONFIRM DIE CHANGE	

4. With the **die recipe database**, each die copy has its own unique recipe. The operator simply selects the die copy for each order to automatically load the optimal recipe values into the system.

A PROVEN DESIGN THAT DELIVERS BREAKTHROUGH RESULTS

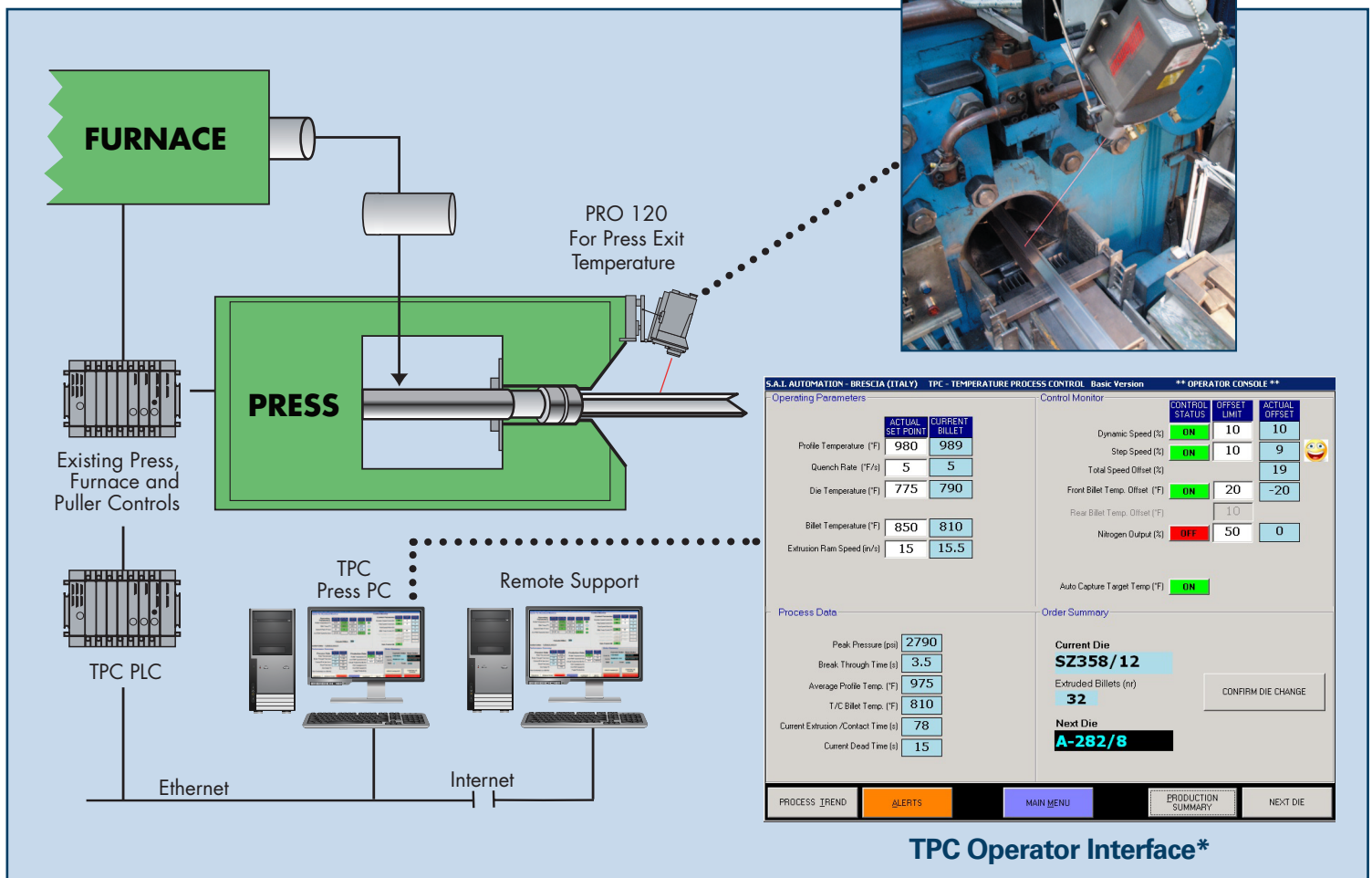
The TPC System features an innovative design that is easy to implement and operate because it works with, instead of replaces, the traditional extrusion controls. The system can be integrated to work with manually operated relay logic systems or fully automated PLC based systems from a variety of manufacturers. The typical TPC Project takes 6-8 weeks to implement from the time the system is ordered and only requires one week of on-site work with no required downtime. There are also many optional features that can be added to the system including live temperature inputs for dies, billets, and quench as well as an advanced order management module and a liquid nitrogen control system. Visit Williamson's website for more details as well as to view a TPC video.

THE TPC ESSENTIALS COMPONENTS

Many installations start with the TPC Essentials Module and then add in other options over time. The typical TPC Essentials configuration includes the following items:

- The TPC Essentials Software includes the Control Module, Recipe Database, and the detailed Reports
- A TPC PLC which can support Allen Bradley, Siemens, GE, and other PLC platforms
- A TPC PC with monitor to be used by the operator at the press
- A Pro 120 Temperature Sensor and an automated panning bracket for measurements at the exit of the press
- Other required software includes SQL Server for the TPC Database and the appropriate PLC Software to establish communications between the PC and the PLC

Automatic Closed Loop Temperature Control for Improved Quality, Productivity, and Consistency



*TPC Application is available in international languages