CONSTANT-SPEED AND ISOTHERMAL EXTRUSION SYSTEM 2025 FOR ALUMINUM EXTRUSION PLANTS

Constant-Speed and Isothermal Extrusion (RcdWin)

+

Extrusion management (EM) Extrusion Data Analysis (EDA)

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THREE PROGRAMS TO IMPROVE ALUMINUM EXTRUSION PRODUCTIVITY AND HELP WITH MAINTENANCE AND DATA ANALYSIS

Constant-Speed and Isothermal Extrusion（RcdWin）

- Each die automatically reduces overshoot and speeds up the start-up.
- Automatically adjusts ram torque relations, rise coefficients, and constant velocity parameters.
- Since constant velocity extrusion is performed by compensating for hydraulic fluctuations, the control is robust and can accommodate long extrusion times.
- It automatically acquires the steady temperature and performs isothermal extrusion at the steady temperature.

Extrusion management（EM）

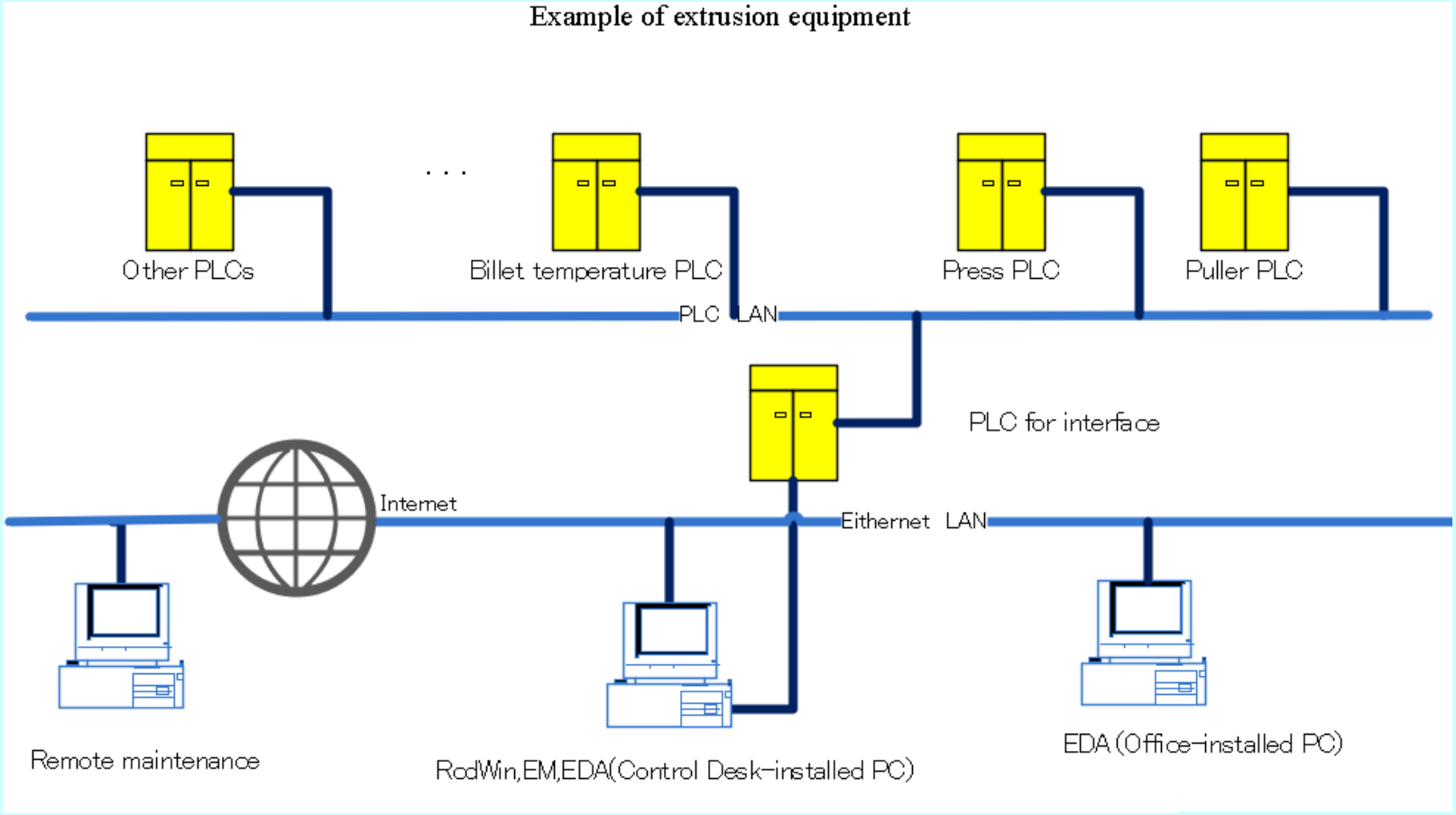
- Extrusion parameters such as extrusion speed are registered and searched in the database for each extrusion die。
- Extrusion work can be performed according to the schedule of the extrusion die unit.
- Switching between constant speed extrusion and isothermal extrusion is performed by EM.

Extrusion Data Analysis（EDA）

- Extrusion billet tables and extrusion graphs for extrusion die units can be used to analyze extrusion data.
- Output daily work report for extrusion die units.
- You can search the extrusion history for each extrusion die.

SYSTEM CONFIGURATION

1. It is a PLC for an interface that connects to one computer and a LAN.
    1. 3 programs work on one computer.
    2. There are two LAN ports on your computer, one for PLC and the second for the Internet.
2. PLC is used to exchange signal data with equipment.
3. You need a LAN for the Internet.
    1. Remote maintenance using the Internet.



EXAMPLE SYSTEM CONFIGURATION (CONSTANT-SPEED EXTRUSION AND ISOTHERMAL EXTRUSION)

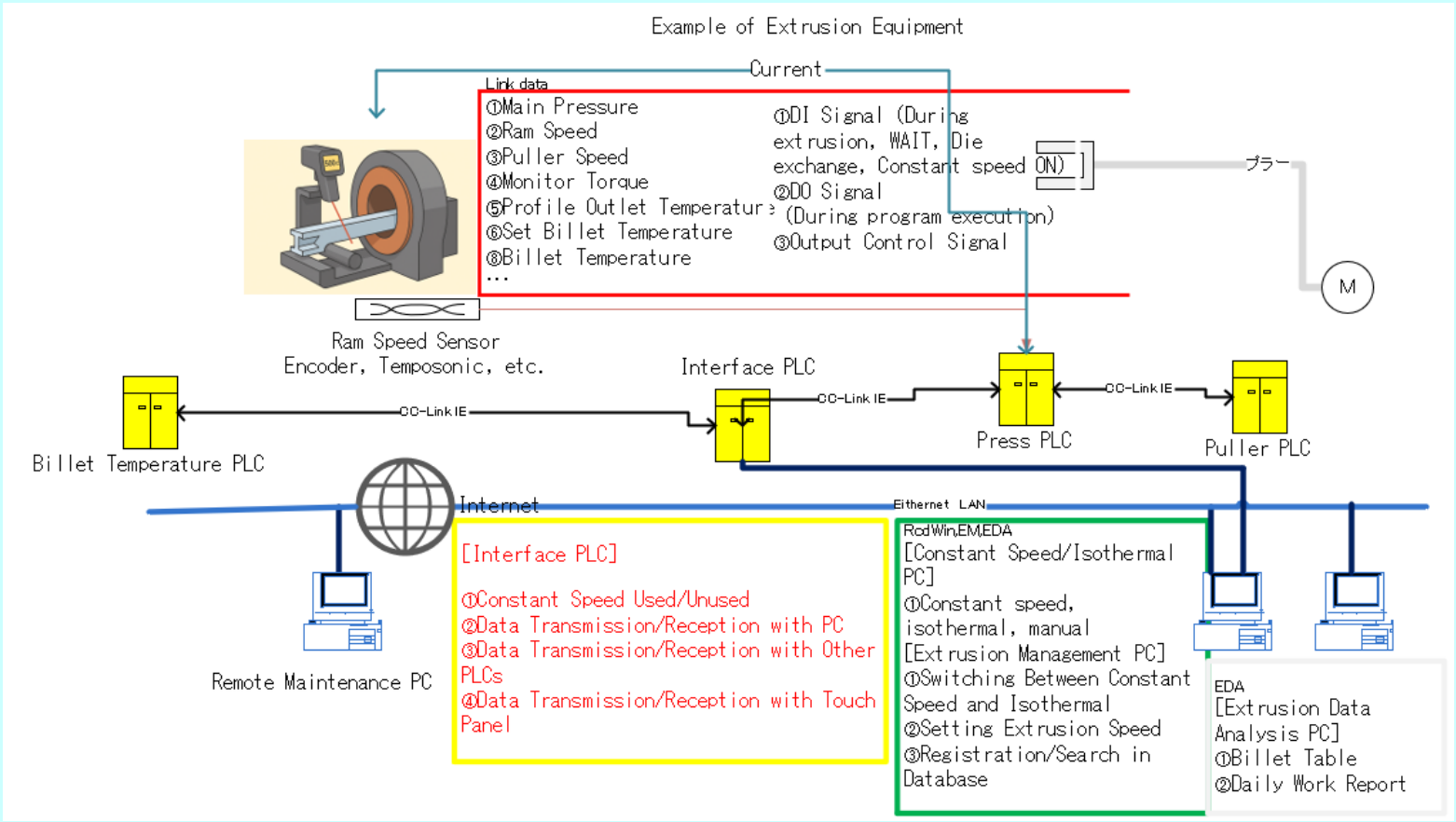
Constant-speed extrusion

1. Analog data requires main pressure, ram speed and monitor torque.
2. Digital in requires cycle stop (Wait), die change, constant velocity use/unused during extrusion.
3. Analog out output control torque.
4. Digital Out is running constant speed program。

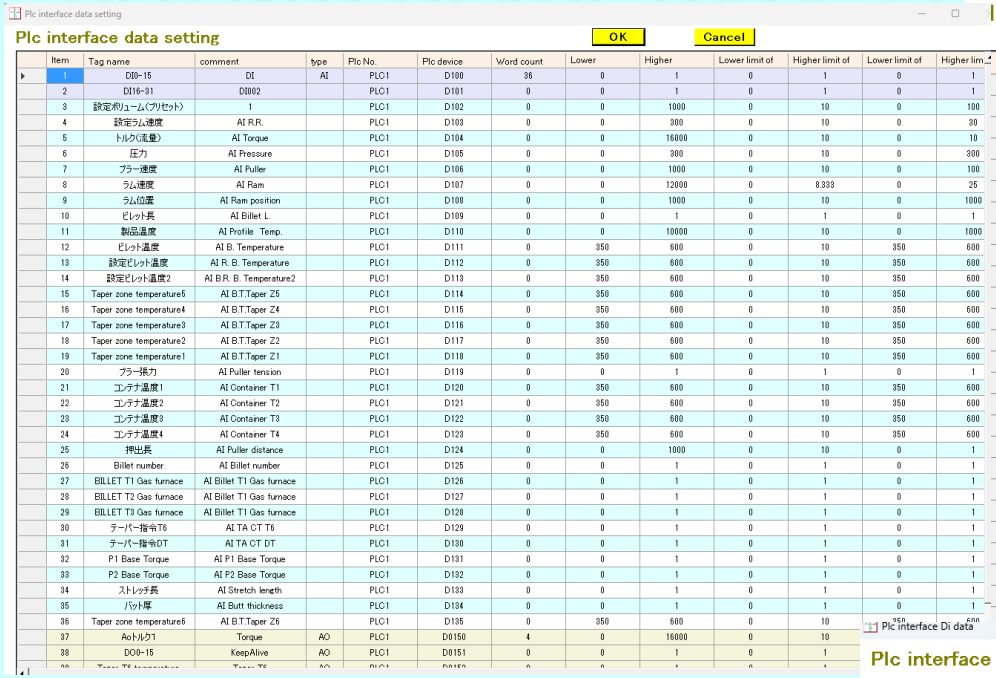
Isothermal extrusion

1. Profile Outlet Temperature。

1. PLC networks can be CC-Link IE field networks, FEnet, etc.
2. Remote maintenance using the Internet.



PLC INTERFACE DATA（RCDWIN）



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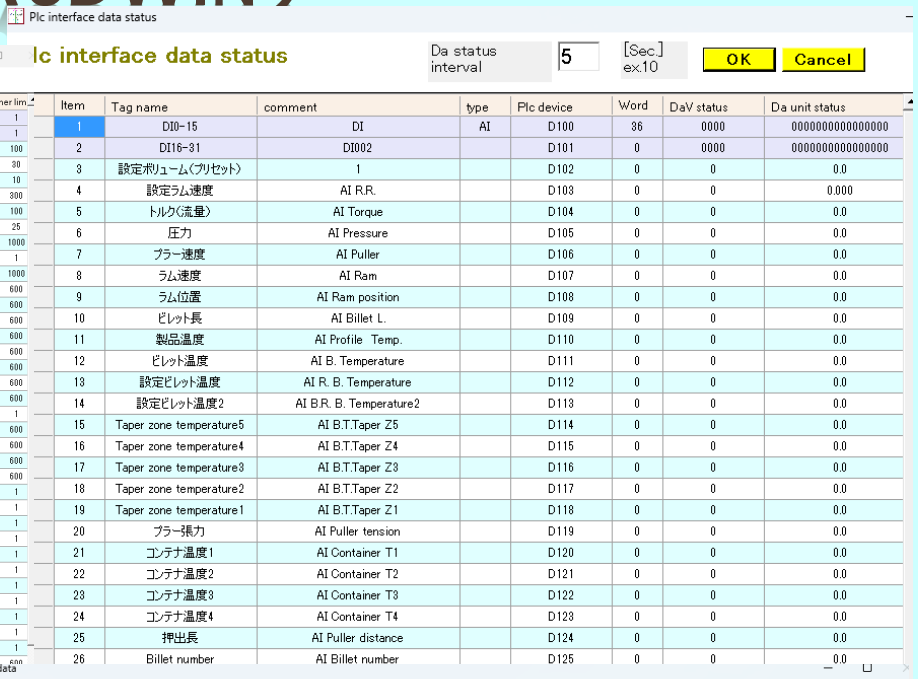
1	DI0-15	DI	AI	PLC1	D100	36	0	1	0	1	0	1
2	DI16-31	DI002		PLC1	D101	0	0	1	0	1	0	1
3	設定ボリューム(プリセット)	1		PLC1	D102	0	0	1000	0	10	0	100
4	設定ラム速度	AI R.R.		PLC1	D103	0	0	300	0	10	0	30
5	トルク(流量)	AI Torque		PLC1	D104	0	0	16000	0	10	0	10
6	圧力	AI Pressure		PLC1	D105	0	0	300	0	10	0	300
7	プラー速度	AI Puller		PLC1	D106	0	0	1000	0	10	0	100
8	ラム速度	AI Ram		PLC1	D107	0	0	12000	0	8.333	0	25
9	ラム位置	AI Ram position		PLC1	D108	0	0	1000	0	10	0	1000
10	ビレット長	AI Billet L.		PLC1	D109	0	0	1	0	1	0	1
11	製品温度	AI Profile Temp.		PLC1	D110	0	0	10000	0	10	0	1000
12	ビレット温度	AI B. Temperature		PLC1	D111	0	350	600	0	10	350	600
13	設定ビレット温度	AI R. B. Temperature		PLC1	D112	0	350	600	0	10	350	600
14	設定ビレット温度2	AI B.R. B. Temperature2		PLC1	D113	0	350	600	0	10	350	600
15	Taper zone temperature5	AI B.T.Taper Z5		PLC1	D114	0	350	600	0	10	350	600
16	Taper zone temperature4	AI B.T.Taper Z4		PLC1	D115	0	350	600	0	10	350	600
17	Taper zone temperature3	AI B.T.Taper Z3		PLC1	D116	0	350	600	0	10	350	600
18	Taper zone temperature2	AI B.T.Taper Z2		PLC1	D117	0	350	600	0	10	350	600
19	Taper zone temperature1	AI B.T.Taper Z1		PLC1	D118	0	350	600	0	10	350	600
20	プラー張力	AI Puller tension		PLC1	D119	0	0	1	0	1	0	1
21	コンテナ温度1	AI Container T1		PLC1	D120	0	350	600	0	10	350	600
22	コンテナ温度2	AI Container T2		PLC1	D121	0	350	600	0	10	350	600
23	コンテナ温度3	AI Container T3		PLC1	D122	0	350	600	0	10	350	600
24	コンテナ温度4	AI Container T4		PLC1	D123	0	350	600	0	10	350	600
25	押出長	AI Puller distance		PLC1	D124	0	0	1000	0	10	0	1
26	Billet number	AI Billet number		PLC1	D125	0	0	1	0	1	0	1
27	BILLET T1 Gas furnace	AI Billet T1 Gas furnace		PLC1	D126	0	0	1	0	1	0	1
28	BILLET T2 Gas furnace	AI Billet T1 Gas furnace		PLC1	D127	0	0	1	0	1	0	1
29	BILLET T3 Gas furnace	AI Billet T1 Gas furnace		PLC1	D128	0	0	1	0	1	0	1
30	テーパー指令T6	AI TA CT T6		PLC1	D129	0	0	1	0	1	0	1
31	テーパー指令DT	AI TA CT DT		PLC1	D130	0	0	1	0	1	0	1
32	P1 Base Torque	AI P1 Base Torque		PLC1	D131	0	0	1	0	1	0	1
33	P2 Base Torque	AI P2 Base Torque		PLC1	D132	0	0	1	0	1	0	1
34	ストレッチ長	AI Stretch length		PLC1	D133	0	0	1	0	1	0	1
35	バット厚	AI Butt thickness		PLC1	D134	0	0	1	0	1	0	1
36	Taper zone temperature6	AI B.T.Taper Z6		PLC1	D135	0	350	600	0	10	350	600
37	Aoトルク1	Torque	AO	PLC1	D0150	4	0	16000	0	10	0	10
38	DO0-15	KeepAlive	AO	PLC1	D0151	0	0	1	0	1	0	1



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2	DI16-31	DI002		D101	0	0000	0000000000000000
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6	圧力	AI Pressure		D105	0	0	0.0
7	プラー速度	AI Puller		D106	0	0	0.0
8	ラム速度	AI Ram		D107	0	0	0.0
9	ラム位置	AI Ram position		D108	0	0	0.0
10	ビレット長	AI Billet L.		D109	0	0	0.0
11	製品温度	AI Profile Temp.		D110	0	0	0.0
12	ビレット温度	AI B. Temperature		D111	0	0	0.0
13	設定ビレット温度	AI R. B. Temperature		D112	0	0	0.0
14	設定ビレット温度2	AI B.R. B. Temperature2		D113	0	0	0.0
15	Taper zone temperature5	AI B.T.Taper Z5		D114	0	0	0.0
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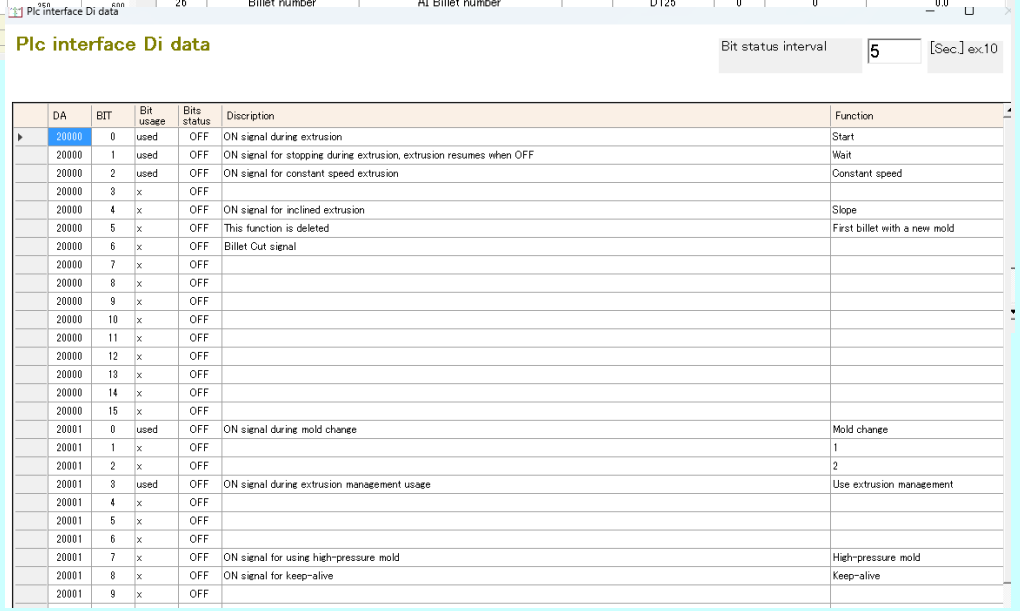
17	Taper zone temperature3	AI B.T.Taper Z3		D116	0	0	0.0
18	Taper zone temperature2	AI B.T.Taper Z2		D117	0	0	0.0
19	Taper zone temperature1	AI B.T.Taper Z1		D118	0	0	0.0
20	プラー張力	AI Puller tension		D119	0	0	0.0
21	コンテナ温度1	AI Container T1		D120	0	0	0.0
22	コンテナ温度2	AI Container T2		D121	0	0	0.0
23	コンテナ温度3	AI Container T3		D122	0	0	0.0
24	コンテナ温度4	AI Container T4		D123	0	0	0.0
25	押出長	AI Puller distance		D124	0	0	0.0
26	Billet number	AI Billet number		D125	0	0	0.0



DA	BIT	Bit usage	Bits status	Discription	Function
20000	0	used	OFF	ON signal during extrusion	Start
20000	1	used	OFF	ON signal for stopping during extrusion, extrusion resumes when OFF	Wait
20000	2	used	OFF	ON signal for constant speed extrusion	Constant speed
20000	3	x	OFF		
20000	4	x	OFF	ON signal for inclined extrusion	Slope
20000	5	x	OFF	This function is deleted	First billet with a new mold
20000	6	x	OFF	Billet Cut signal	
20000	7	x	OFF		
20000	8	x	OFF		
20000	9	x	OFF		
20000	10	x	OFF		
20000	11	x	OFF		
20000	12	x	OFF		
20000	13	x	OFF		
20000	14	x	OFF		
20000	15	x	OFF		
20001	0	used	OFF	ON signal during mold change	Mold change
20001	1	x	OFF		1
20001	2	x	OFF		2
20001	3	used	OFF	ON signal during extrusion management usage	Use extrusion management
20001	4	x	OFF		
20001	5	x	OFF		
20001	6	x	OFF		
20001	7	x	OFF	ON signal for using high-pressure mold	High-pressure mold
20001	8	x	OFF	ON signal for keep-alive	Keep-alive
20001	9	x	OFF		

PLC Interface Data

- Set PLC interface data with RcdWin.
- Top right: Set the scale or unit of analog data.
- Top left: Displays current analog data, DI values.
- Bottom right: DI data settings. Commonly used are:

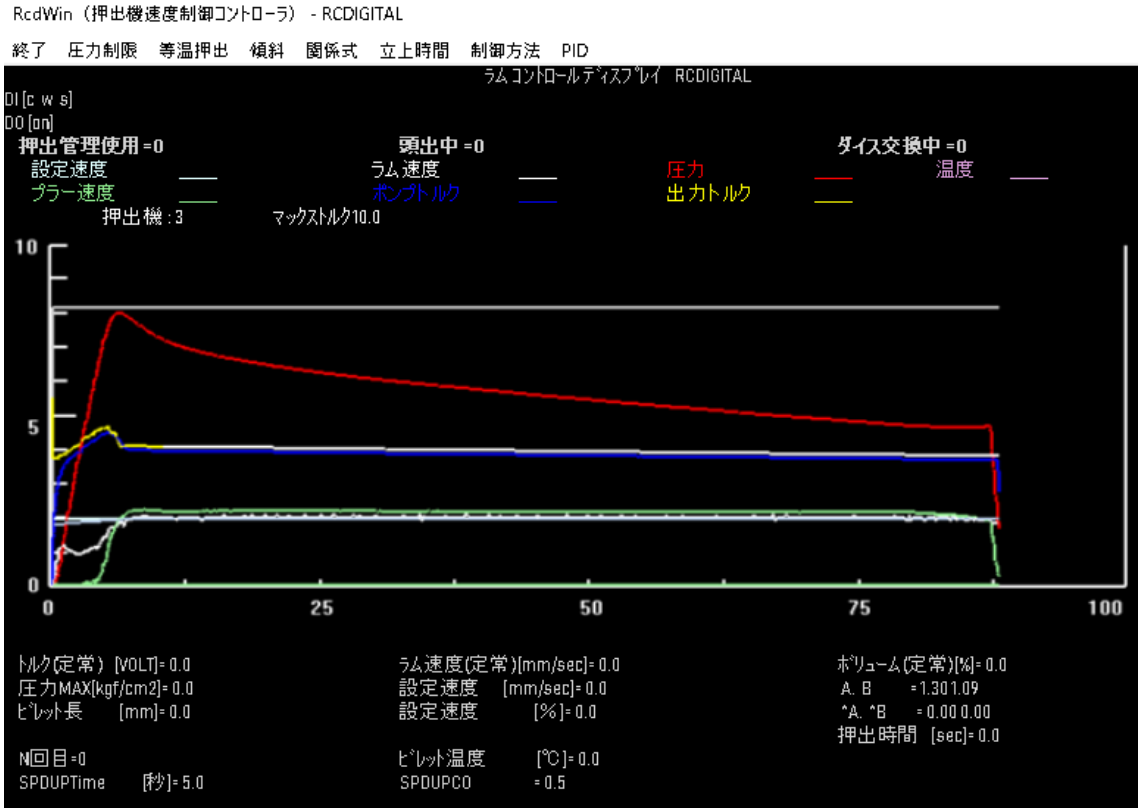
Under Extrusion,
Cycle Stop,
Constant Velocity Use,
Extrusion die exchange DI

There are only 4 of them. In other words, if you send these four to the interface PLC, RcdWin will work.

CONSTANT-SPEED EXTRUSION （RCDWIN） -CONTROL SCREEN

Graph line names

1. Light blue : set speed,
2. White : ram speed,
3. Red : Pressure,
4. Green : Puller speed,
5. Blue : Monitor Torque Torque The torque signal that is actually pumped out,
6. Yellow : Torque signal by RcdWin (white when stationary. ），
7. Approx. 8V white : Pressure limit



About 5 seconds after the start, the ram speed is at constant speed.

CONSTANT-SPEED EXTRUSION（RCDWIN）- OVERSHOOT PREVENTION

Overshoot prevention

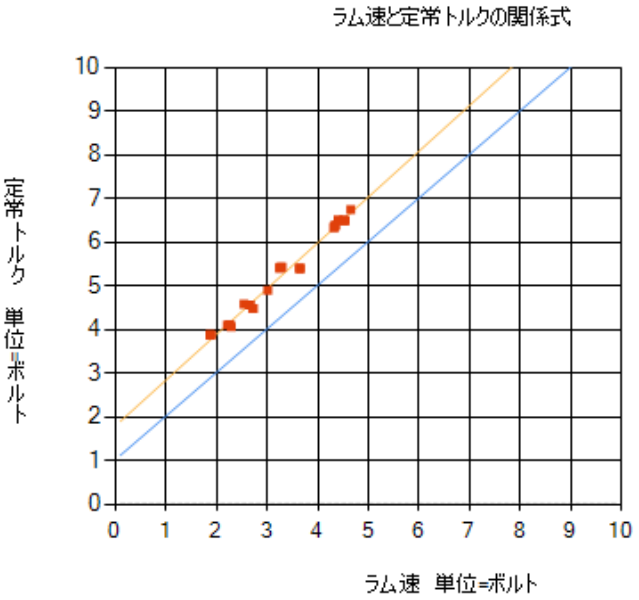
1. Torque Ram Speed Relationship Predicts Ram Speed Rise to Prevent Overshoot.
2. With normal PID control, the amount of overshoot is large.

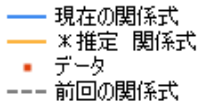
Productivity Enhancement

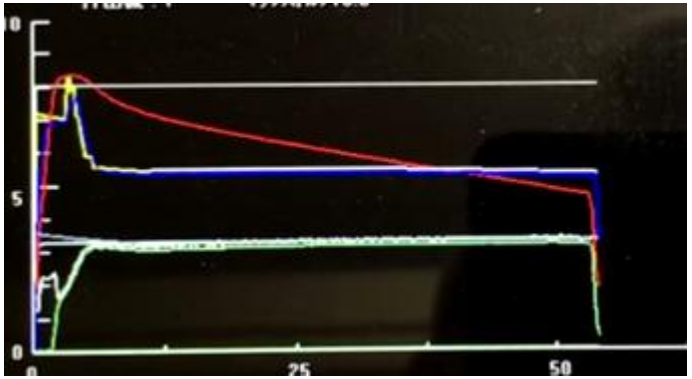
1. Overshoot prevention allows for higher extrusion setting speeds and higher production.
2. Automatic adjustment of the setting speed without the need for an operator compensates for hydraulic fluctuations during long-term extrusion and provides constant velocity control.

Improved maintainability

1. Ram torque relations, rise coefficients, and constant velocity parameters can be automated.







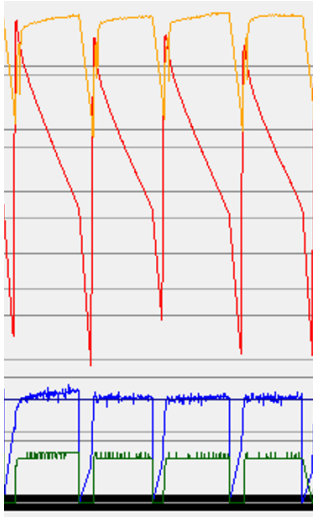
RcdWin does not overshoot.

Ram speed and torque have a linear relationship.

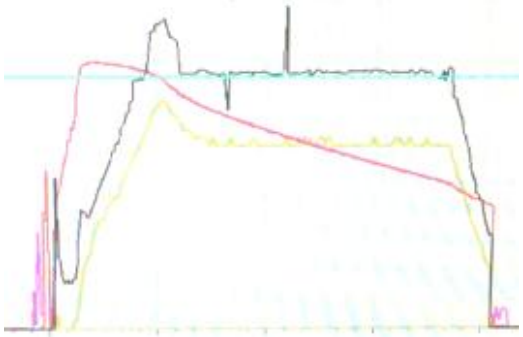
Note > we use the word torque to mean the flow rate of oil.

The first one is manual, the second, third and fourth are constant speed. There is no change in noise whether manual or constant speed.

Note> Even if you use constant velocity extrusion, the ram speed will not be beautiful. Normally, ram speed is accompanied by periodic noise of about 1 second.



Normal PID control overshoots.

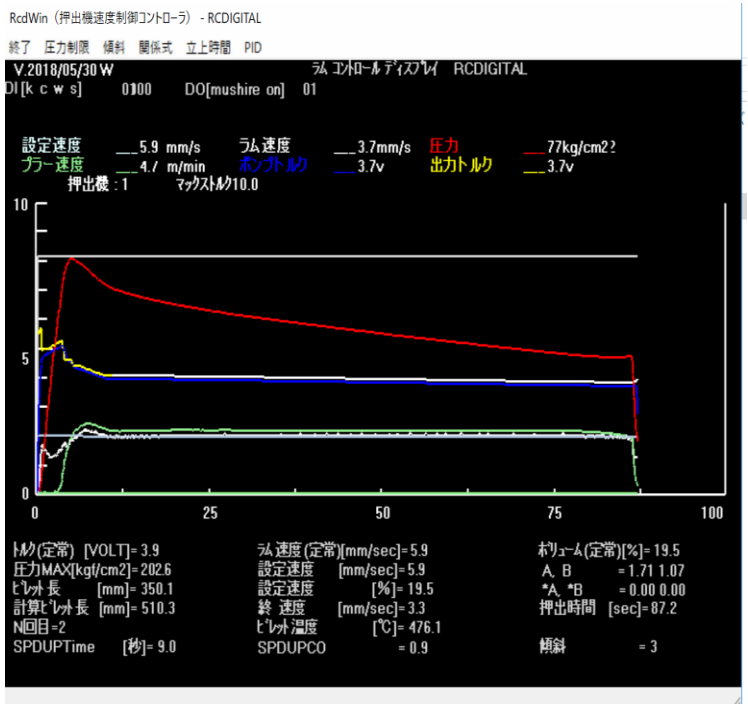


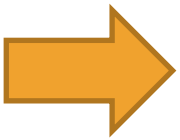
CONSTANT-SPEED EXTRUSION （RCDWIN）- AUTOMATE RISE ADJUSTMENT

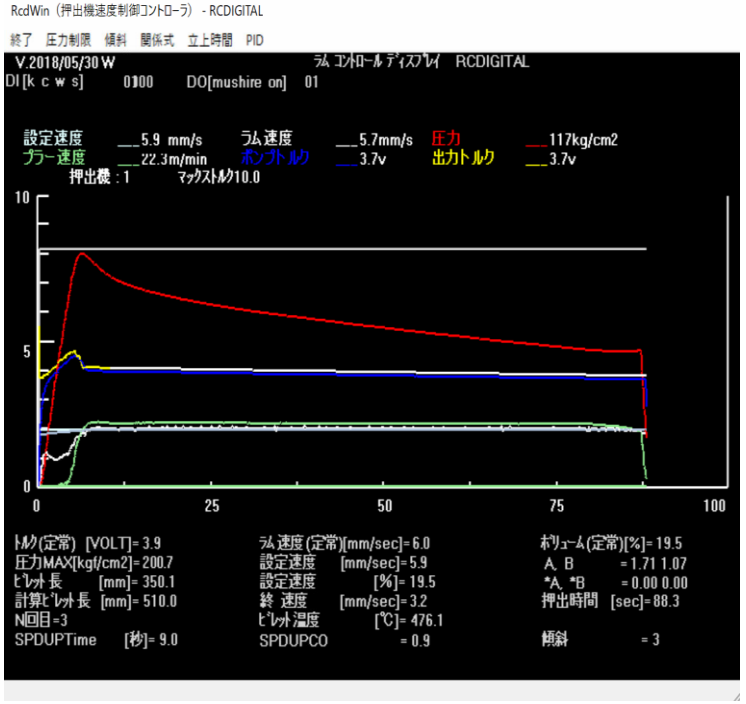
Automatically adjusts to reduce overshoot and get up faster.

・Automatically adjusts the rise even when the extrusion die changes.

・The automation parameters are the start-up coefficient and the start-up time.



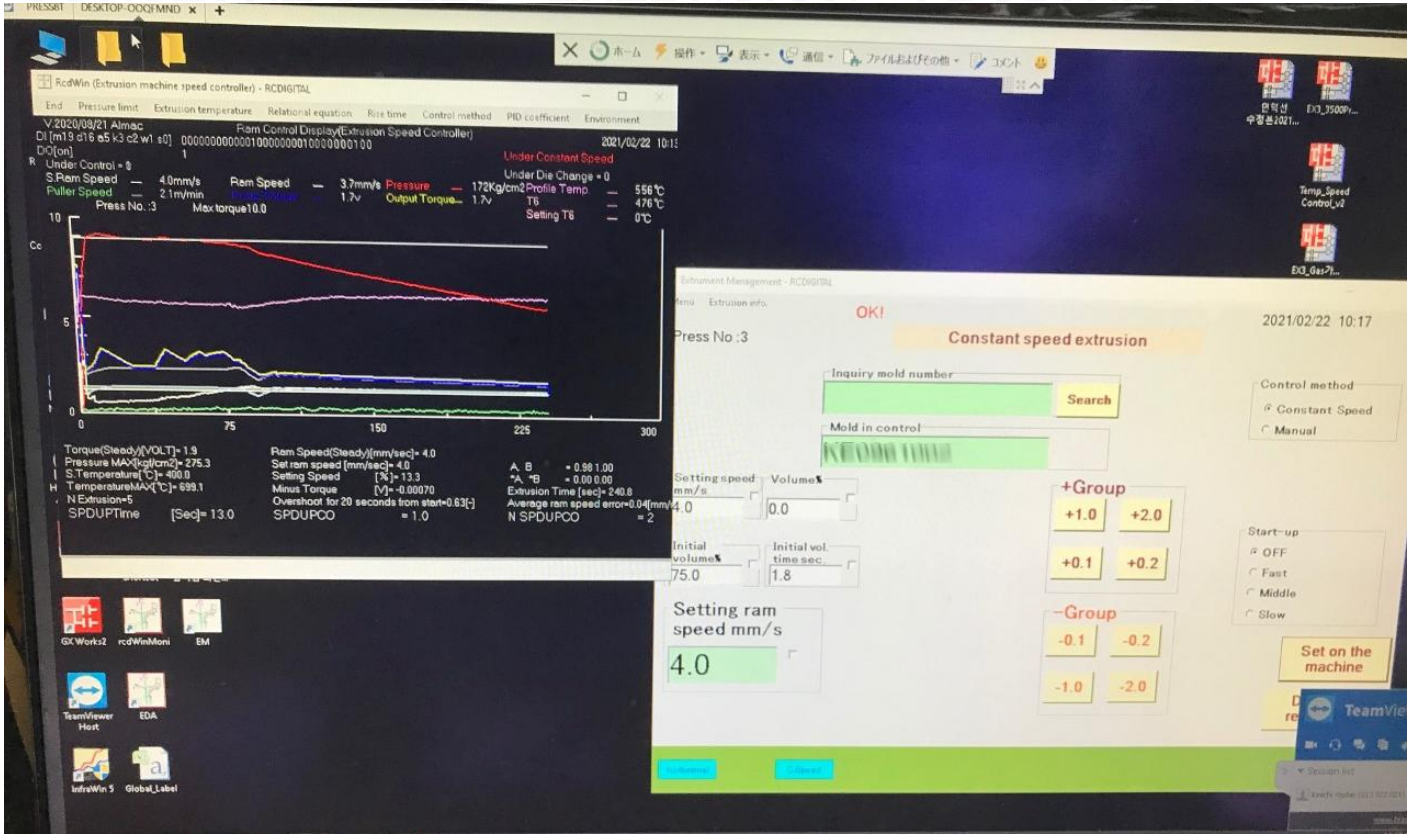




Overshot with a rise coefficient of 1.0.

The rise factor is now automatically 0.9. It almost no longer overshoots.

CONSTANT-SPEED EXTRUSION （RCDWIN）-PRESSURE LIMITING



Overshoot prevention

・As you can see in the figure, dynamically fine-tune the set speed near the extrusion set speed. This is to prevent overshoot。

・Changing the extrusion setting speed is usually done by the operator, but RcdWin does it automatically. It will save labor. Adjustment of PID parameters used to prevent overshoot is no longer required。

Pressure Limiting

・When the pressure exceeds the relief pressure, the extrusion rate hardly rises.

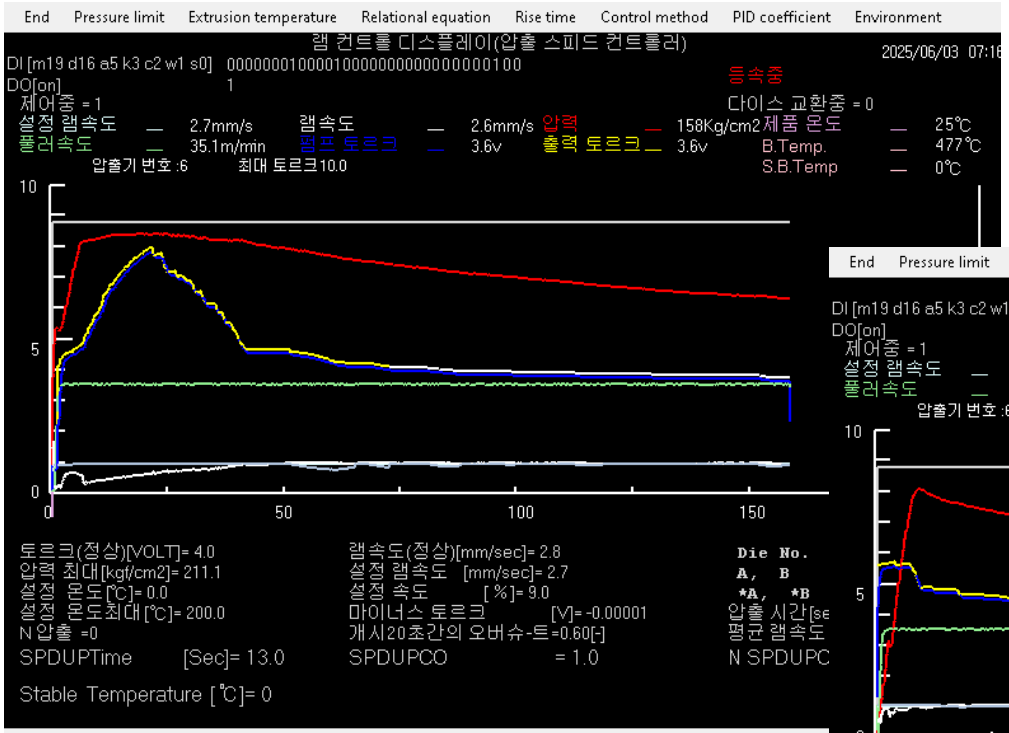
・Therefore, the control voltage is reduced to save energy. Thermal relay will be turned on for long full load operation. Manufacturing is interrupted and product defects。In addition, long-term full-load operation can cause the profile to pop out and make the operator dangerous. Prevent them。

It may start up a little slower, but it will save energy and prevent trouble, and as a result, productivity will increase. It also seems that they are sometimes used to make the machine last longer。

CONSTANT-SPEED EXTRUSION （RCDWIN）—MINIMUM CONFIGURATION

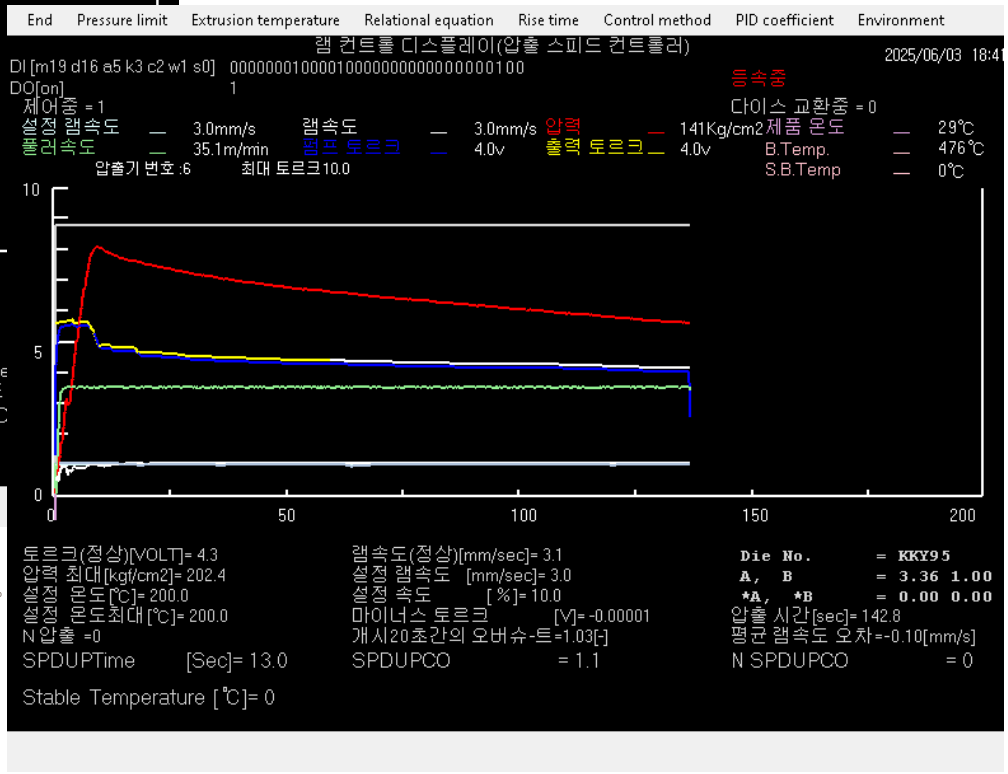
Minimum configuration

ram speed,
pressure
Monitor Torque
If there are three pieces of data, constant velocity extrusion is possible.
I think that equipment modification companies estimate construction in units of one measurement data. Being able to control constant velocity with less data is an advantage for the factory because the cost of construction is lower.



Quick constant velocity extrusion with rising

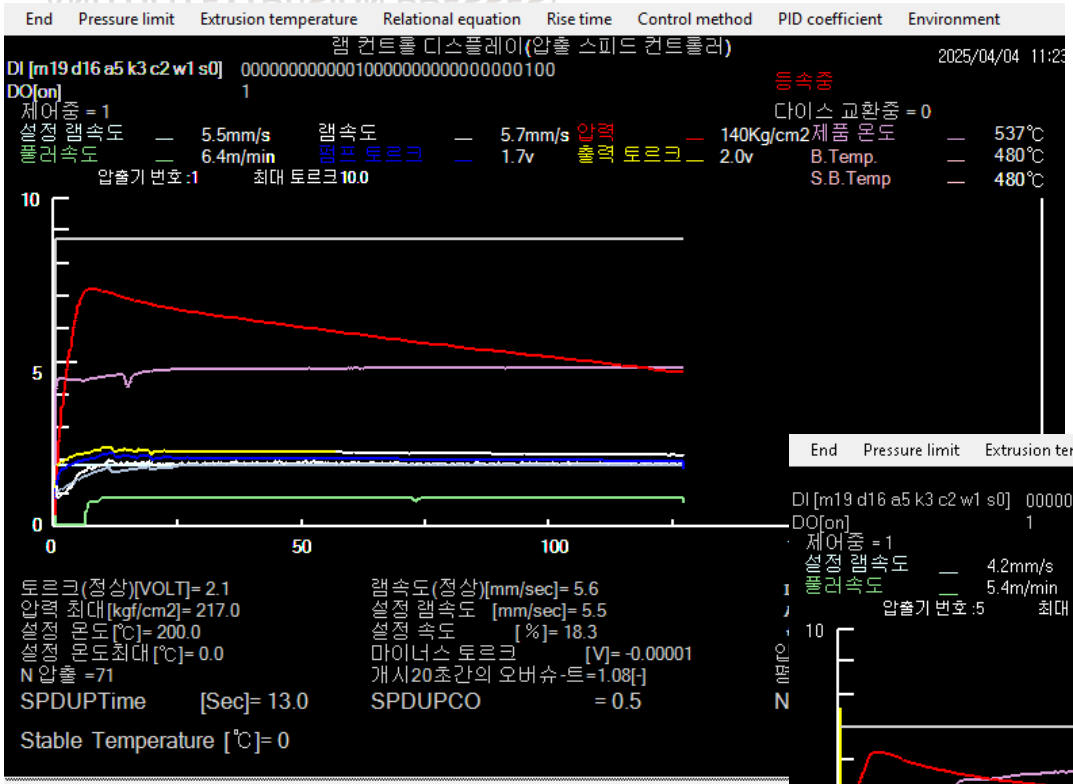
・Low pressure fluctuations do not result in automatic adjustment of the set speed.



Constant Velocity Extrusion When Flow Flows Away from Relief

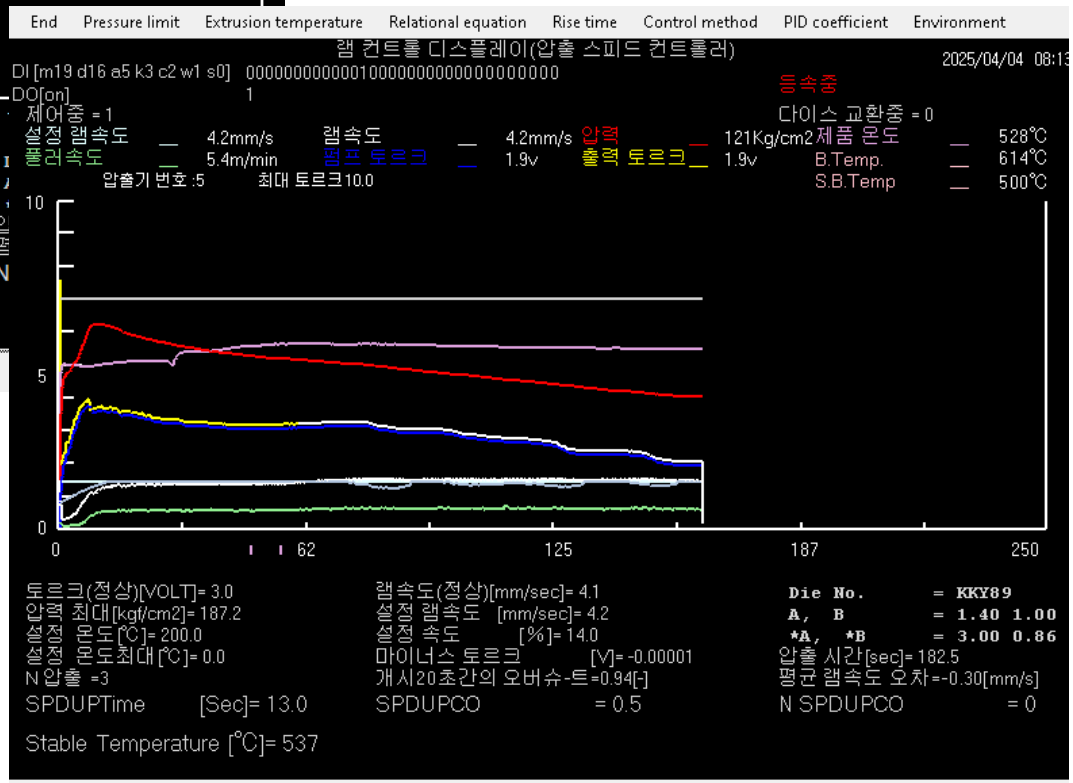
・Automatic adjustment of the set speed ensures no overshoot。

CONSTANT-SPEED EXTRUSION （RCDWIN） -HYDRAULIC FLUCTUATION COMPENSATION (NEW AND OLD EXTRUSION PRESSES)



For older extrusion presses

- Pressure fluctuations 375 times. Frequent pressure fluctuations are compensated for by adjusting the speed of the automatic setting speed in three times。
- The automatic setting speed adjusts the set speed on behalf of the operator.



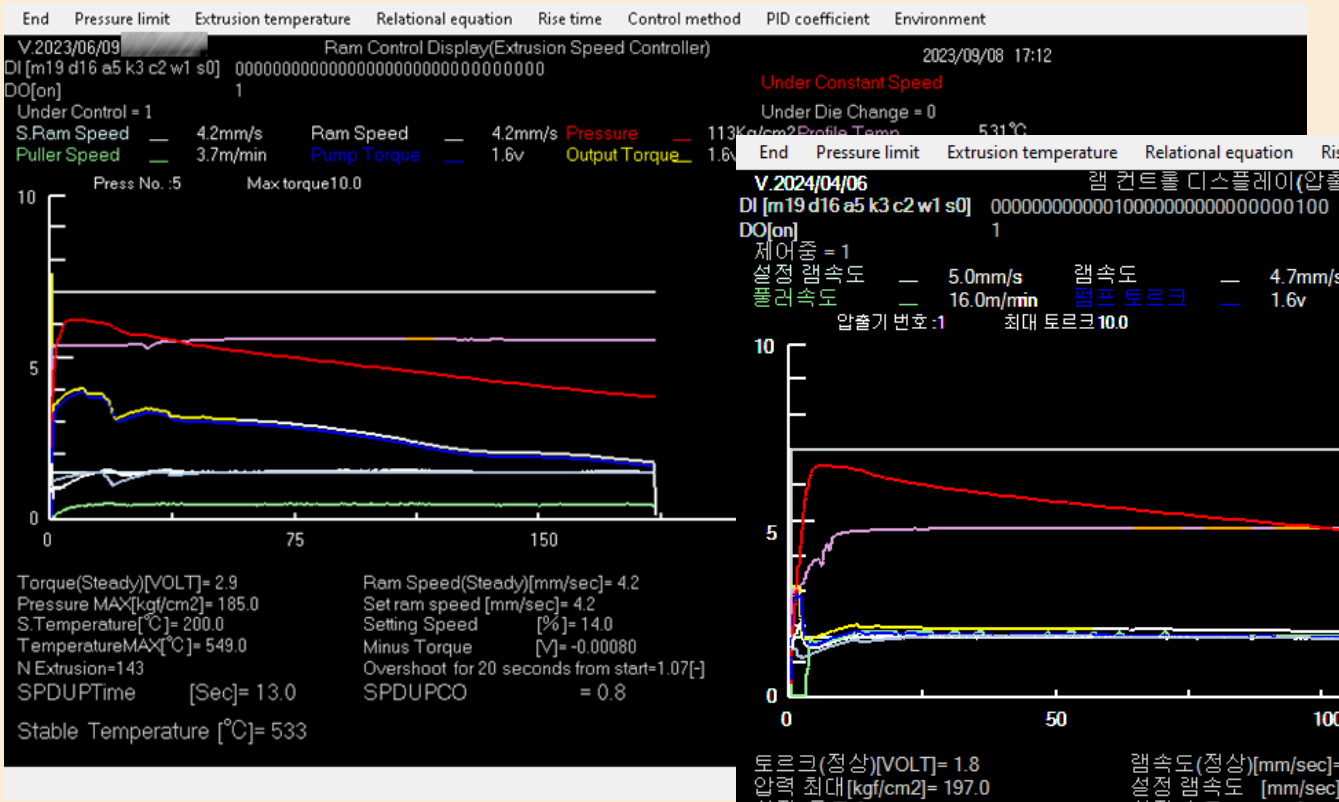
For new extrusion presses

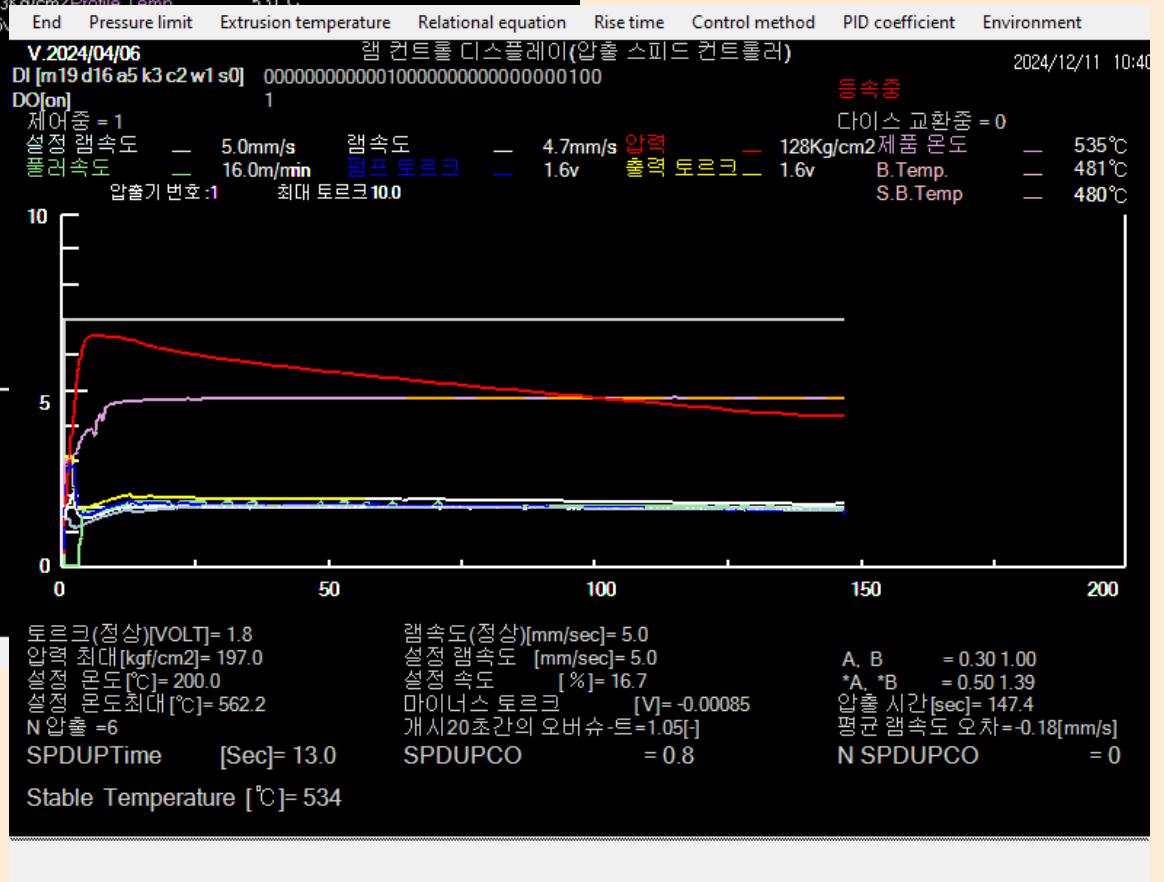
- Pressure fluctuations 180 times.
- There is only one time for start-up, and there is a correction by automatically adjusting the set speed.

CONSTANT-SPEED EXTRUSION （RCDWIN） -ISOTHERMAL EXTRUSION AT STEADY TEMPERATURE.

Isothermal pressing

- When isothermal extrusion is performed, the set temperature is automatically calculated and isothermal extrusion is performed.
- You can check the billet taper, billet temperature, and steady temperature in the billet table.
- If the product temperature deviates from the steady temperature, fine-tuning is made.
- If the steady temperature cannot be obtained, constant velocity extrusion is performed.





The set speed is tilted to reduce the product temperature.

EXTRUSION MANAGEMENT （EM）

1. Register, change, and search for constant speed extrusion and isothermal extrusion parameters on an extrusion die basis.
2. Setting the extrusion speed.
3. Schedule Management.
4. Constant Speed Extrusion/Isothermal Extrusion/Manual Switching.

Constant Velocity Extrusion (RcdWin) and Extrusion Management (EM)

- I'm setting the set speed with EM and running constant speed extrusion with RcdWin.

EXTRUSION DATA ANALYSIS （EDA） -EXTRUSION DIE SELECTION AND IDLE TIME GRAPH

feature

・Extrusion data analysis, work history, extrusion billet table, work daily report.

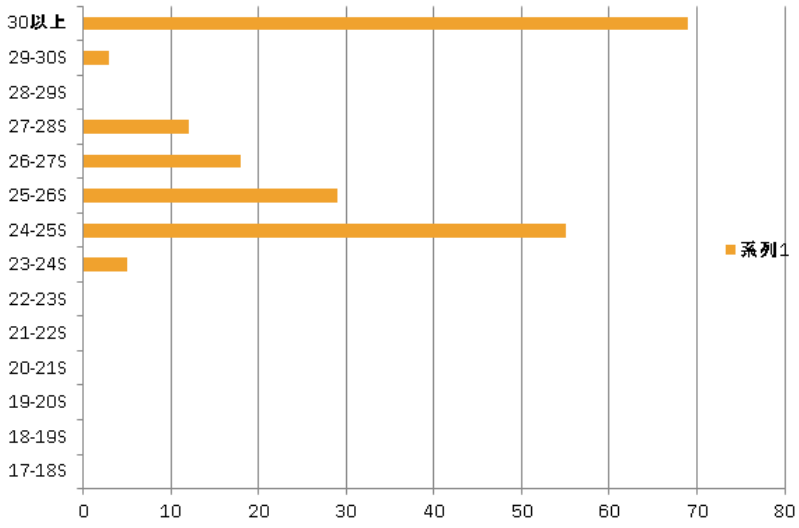
Various functions

1. Extruded billet table, work daily report.
2. Detection of abnormal data in equipment.
3. CSV graph of non-extrusion time (idle time), chocolate stop, and die exchange time.
4. History of extrusion parameters per extrusion die.
5. Real-time monitor.
6. Extrusion Data Graph.

・Select [Extrusion Die Model Number] and click History.
・You will be taken to the [Extrusion Die Usage History] screen.

Non-extrusion time Xlsx file

1. Click on Non-Extrusion Time Xlsx File.
2. The idle time of the Start and End periods is printed in the Xlsx file in the graph.



EXTRUSION DATA ANALYSIS （EDA） -EXTRUSION DIE USAGE HISTORY AND EXTRUSION BILLET TABLE SCREEN

Extrusion die usage history

1. View the usage history of the same extrusion die in order from the newest.
2. Displays the extrusion parameters of the extrusion die for the selected day in the table below.
3. The extrusion manager can examine the parameter transitions.
4. You can ask the operator why the parameter was changed. In particular, changing the extrusion speed is an important item because it is directly related to productivity.
5. When you run the Extrusion Billet Table, you will be taken to the Print Form screen for the extrusion of the extrusion die on the selected day.

Extruded Billet Table Screen

1. Printing of Extruded Billet Table.
2. Setting Outliers in Measurement Data.
3. Extrusion die unit extrusion graph display.
4. 1Display of extrusion graph for each extrusion.

EXTRUSION DATA ANALYSIS （EDA） -EXTRUSION BILLET TABLE AND EXTRUSION GRAPH

Extrusion Billet List

- Extrusion die unit information: extrusion die number, first start time and last billet end time, etc.
- Billet unit information: set ram speed, ram speed, puller speed, main pressure, Max main pressure, Max main pressure duration, etc.
- You can select the items you want to chart.
- The form is Excel.

Extrusion Chart

- Graph display of report data.
- Manual on the left: Ram speed is slowly increasing.
- Constant speed on the right: The ram speed is according to the set speed. It does not rise. However, the ram speed can be observed in the same way as manual vibrations and noises of the machine.
- This means that even if there is noise, constant velocity extrusion is possible, so it can be understood that robust constant velocity control is being carried out.

押出ビレット一覧表

開始時間 18:11:47　終了時間 19:56:13

Date: 2025/05/29

Mold No.

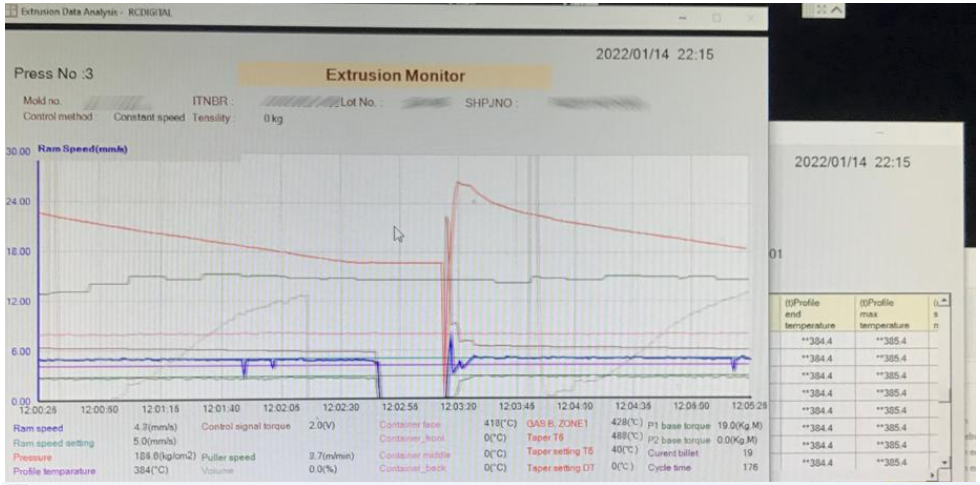
Extrusion press No. 1

押出ビレット数	制御方法	ビレット長	押出時間	アイドル時間	定常温度	開始製品温度
N	-	mm	sec	sec	℃	
1	Constant speed	515	77.5	**118.2	0	497.
2	Constant speed	875	85.6	53.6	0	299.
3	Constant speed	955	160.0	25.8	0	474.
4	Constant speed	865	174.1	30.4	0	465.
5	Constant speed	940	162.4	24.4	0	501.
6	Constant speed	865	177.3	30.2	0	473.
7	Constant speed	950	163.2	24.6	0	508.
8	Constant speed	865	179.7	58.4	0	469.
9	Constant speed	940	163.8	82.8	0	471.
10	Constant speed	865	178.6	29.3	0	376.
11	Constant speed	940	163.4	24.4	0	501.
12	Constant speed	865	178.5	29.5	0	473.
13	Constant speed	940	163.1	23.2	0	508.
14	Constant speed	865	178.2	29.2	0	473.
15	Constant speed	940	161.8	24.5	0	501.
16	Constant speed	865	178.3	29.6	0	469.
17	Constant speed	935	163.2	25.1	0	504.
18	Constant speed	865	177.3	62.8	0	465.
19	Constant speed	940	163.7	23.6	0	469.
20	Constant speed	865	176.8	29.6	0	474.
21	Constant speed	935	163.0	24.4	0	504.
22	Constant speed	865	175.0	28.9	0	472.
23	Constant speed	935	162.9	24.0	0	494.
24	Constant speed	865	176.2	28.8	0	468.
25	Constant speed	935	162.1	24.2	0	507.
26	Constant speed	870	176.0	28.5	0	469.
27	Constant speed	935	164.7	24.7	0	516.
28	Constant speed	860	177.1	28.9	0	510.
29	Constant speed	930	162.5	24.8	0	513.
30	Constant speed	860	176.9	31.0	0	512.
31	Constant speed	565	163.5	28.9	0	512.
32	Constant speed	300	104.0	0	0	509.

EXTRUSION DATA ANALYSIS （EDA） -REAL-TIME MONITOR AND GRAPH PER EXTRUSION DIE

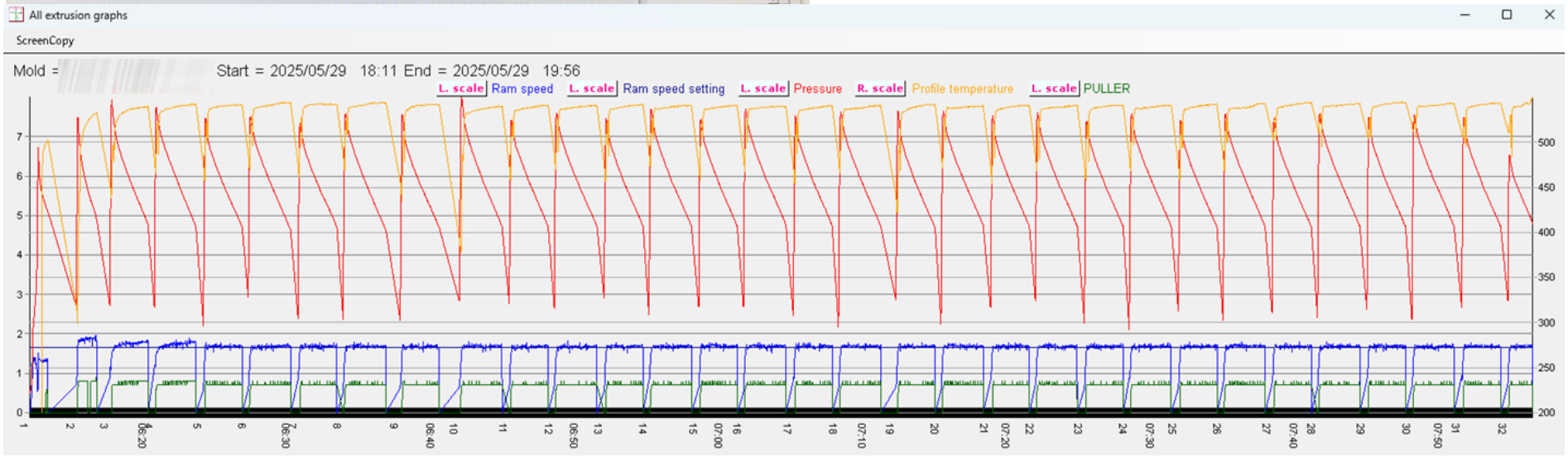
Real-time monitor

- You can see the extrusion status in real-time graphs.
- die-specific information: die number, etc.
- Per-billet information: set ram speed, ram speed, puller speed, pressure, billet length, etc.



Extrusion graph per extrusion die

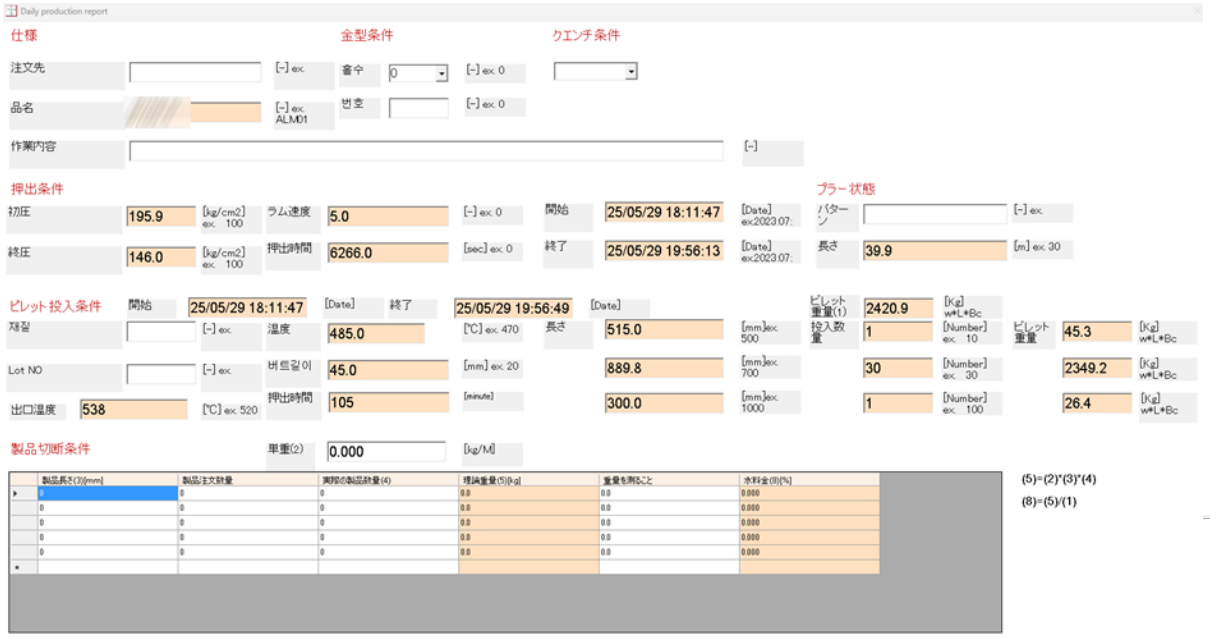
- All extrusion graphs for each extrusion die can be displayed in a single diagram.
- The first billet involves **head feeding** and **manual extrusion**.
- The second and third billets are processed by **manual extrusion**.
- From the fourth billet onward, **constant-speed extrusion** is applied.



EXTRUSION DATA ANALYSIS （EDA） -AUTOMATIC CREATION OF WORK DAILY REPORTS

Work Daily Report Input Form

- The automatic calculation shows the extrusion die number, extrusion time, number of billets, billet length, billet weight, etc.
- The orange part is an item that is automatically calculated.



Daily Report

- This is a summary table for each extrusion die for one day.

REMOTE MAINTENANCE

1. There are three maintenance methods: remote support, constant monitoring. Install the TeamViewer Host.exe for remote monitoring software for constant monitoring.

2. When requesting an extrusion survey, log in to the constant velocity extrusion computer and investigate the extrusion data. The constant velocity extrusion computer records data so that past extrusion conditions can be reproduced.

3. During the investigation, you need to connect your local network to the Internet network. This is done by plugging the LAN cable of the Internet into the hub for the local network.

4. Remote maintenance is not only provided to Japan but also to factories in Korea.

5. TeamViewer automatically detects firewall and proxy settings for remote monitoring. Communication is encrypted.

You can use TeamViewer to log in to PCs in different countries to install and maintain programs.