

New emulsion production machine status and discussion for underground activities

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Motivation

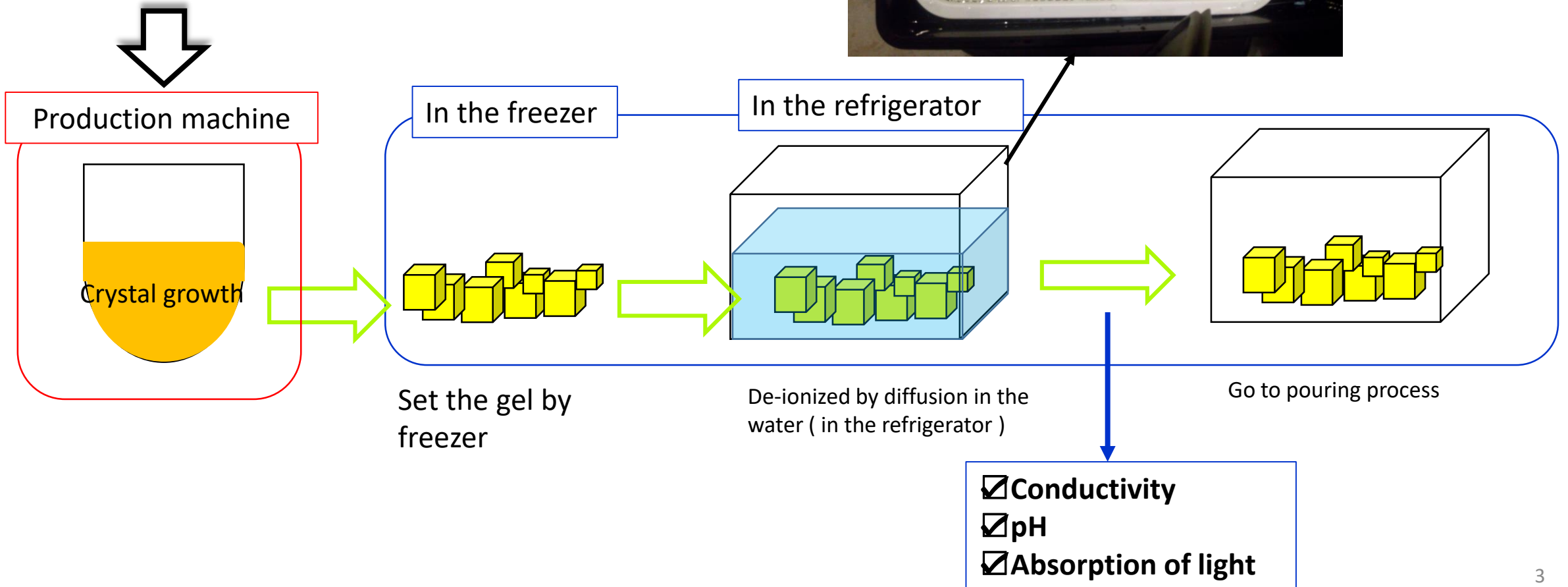
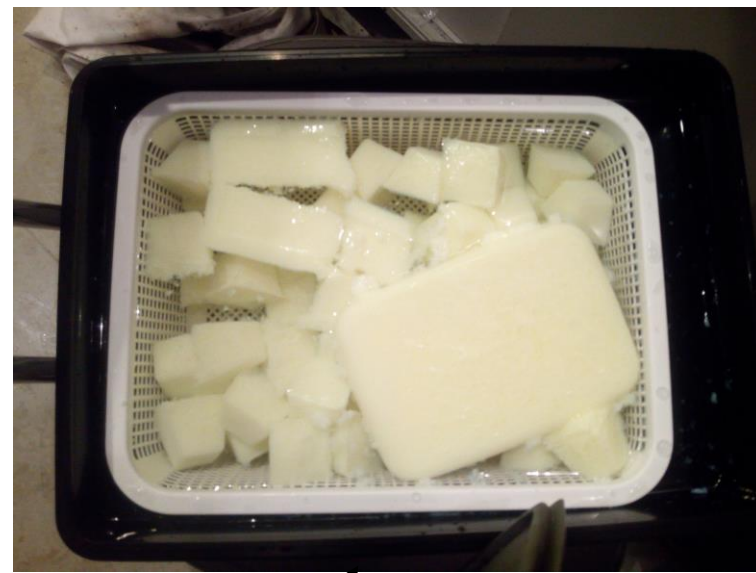
- All process should be done in same environment with cleaner level.
- Especially, emulsion gel. production is essentially important in terms of intrinsic background and contamination.
- More efficiently underground activity will be needed, specially detector calibration and construction.

This is first challenge for new nuclear emulsion experiment

Overall production process

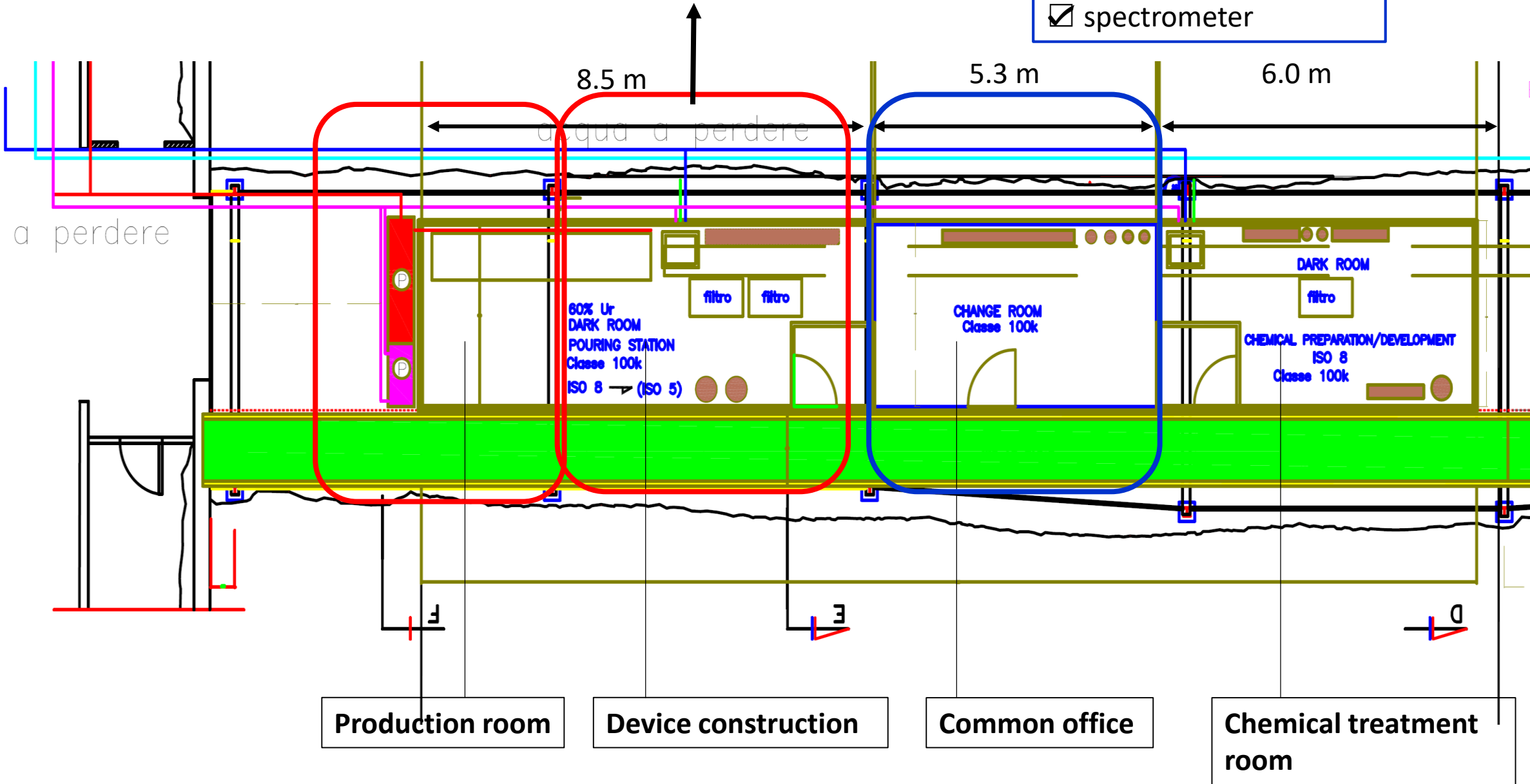
Prepared chemical solution

- ◆ Gelatin filtering process
- ◆ Prepare the chemical (AgNO_3 , NaBr and other solution)



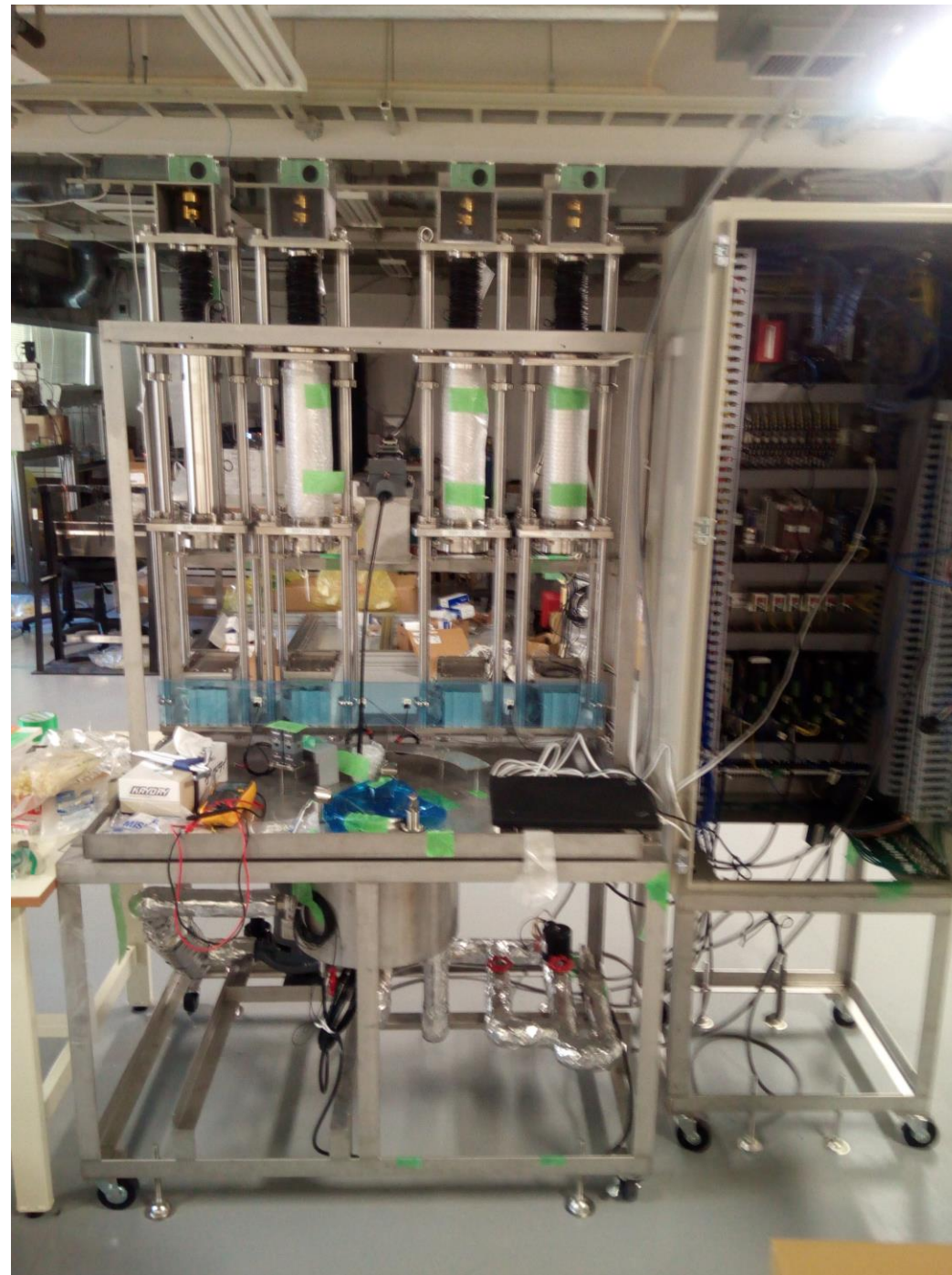
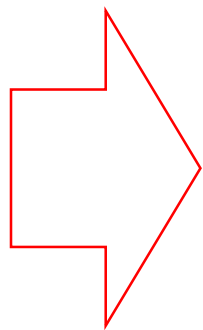
Refrigerator+ freezer

- pH meter
- conductivity meter
- spectrometer



New Production Machine Status

Last meeting [Feb., 2018]



Updated Schedule

2017

Sep. 20th : Detail discussion with Tera company and Nagoya's member, and decided the main design and schedule **Done**

Oct. : making the document of estimation and officially ordered the machine. **Done**
Already started to order the materials for the control panel and driving system

Nov. : Start to produce the hardware of machine **Done**
Start to construct the control panel and driving system

Dec. ⇒ Feb. : some part of hardware will arrive at Nagoya and start the construction **Done**
* Schedule was delayed

Feb. – May., 2018 : construction of the machine and commissioning **Now is here**

June or July ., 2018 : Start to transport the machine to LNGS

Around summer , 2018 : re-construction of the machine and start to do the commissioning again at LNGS

Control monitor panel is mostly ready (both Japanese and English mode)

EMS-3000

MENU

Temp & Stirring Settings Save to USB

SSP Operations Timer Settings

Prescription Forms Main Controls

Operation Results Temperature Chart

SSP Parameter Settings Addition Chart

Alarm History

Temp & Stirring Settings 10:15:47 Alarm: Pump Breaker Tripped

Pattern	1	2	3	4	5	Outer PID Settings	Inner PID Settings	Edit	Cancel	Save		
STEP 01	123.4°C	123 M 12 S	Outer	Inner	12	12	12	-12.3	-12.3	-12.3	-12.3	1234
STEP 02	123.4°C	123 M 12 S	Outer	Inner	12	12	12	-12.3	-12.3	-12.3	-12.3	1234
STEP 03	123.4°C	123 M 12 S	Outer	Inner	12	12	12	-12.3	-12.3	-12.3	-12.3	1234
STEP 04	123.4°C	123 M 12 S	Outer	Inner	12	12	12	-12.3	-12.3	-12.3	-12.3	1234
STEP 05	123.4°C	123 M 12 S	Outer	Inner	12	12	12	-12.3	-12.3	-12.3	-12.3	1234
STEP 06	123.4°C	123 M 12 S	Outer	Inner	12	12	12	-12.3	-12.3	-12.3	-12.3	1234
STEP 07	123.4°C	123 M 12 S	Outer	Inner	12	12	12	-12.3	-12.3	-12.3	-12.3	1234
STEP 08	123.4°C	123 M 12 S	Outer	Inner	12	12	12	-12.3	-12.3	-12.3	-12.3	1234
STEP 09	123.4°C	123 M 12 S	Outer	Inner	12	12	12	-12.3	-12.3	-12.3	-12.3	1234
STEP 10	123.4°C	123 M 12 S	Outer	Inner	12	12	12	-12.3	-12.3	-12.3	-12.3	1234
STEP 11	123.4°C	123 M 12 S	Outer	Inner	12	12	12	-12.3	-12.3	-12.3	-12.3	1234

Inner PID Settings 10:16:17 Alarm: Pump Breaker Tripped

SP 123.0°C
PV 123.0°C
MV 123.0%

Items Value Items Value

Proportional Gain	123.00	Change Amount Limit (Isec)	123.00 °C
Integral Gain	123.00	Rate of Change (Isec)	123.00 %
Derivative Gain	123.00	Coefficient 'a' to compute SP	123.00
MV Upper Limit	123.00 %	Coefficient 'b' to compute SP	12.34 °C
MV Lower Limit	123.00 %	MV+a+b	123.4 °C

Inner PID Parameters 10:16:49 Alarm: Pump Breaker Tripped

	1	2	3	4	5	6	7	8
Proportional Gain	123.00	123.00	123.00	123.00	123.00	123.00	123.00	123.00
Integral Gain	123.00	123.00	123.00	123.00	123.00	123.00	123.00	123.00
Derivative Gain	123.00	123.00	123.00	123.00	123.00	123.00	123.00	123.00
MV Upper Limit	123.00	123.00	123.00	123.00	123.00	123.00	123.00	123.00
MV Lower Limit	123.00	123.00	123.00	123.00	123.00	123.00	123.00	123.00

Timing Signal Settings 10:17:21 Alarm: Pump Breaker Tripped

Timing Signal 1 Preliminary Operation Fin This Signal will be on when Program is Finished.

Process Step No. which this Signal is Used: 12

Condition of Signal: Active inactive

Time to determine that condition is true: 12.3 S

Elastic Time of the Stop when this Signal is Active: 123 M 12 S

Temp Deviation to Determine that Condition is True: 12.3

Timing Signal 2 Finish to Manufacture This Signal will be on when Program is Finished.

Process Step No. which this Signal is Used: 12

Condition of Signal: Active inactive

Time to determine that condition is true: 12.3 S

Elastic Time of the Stop when this Signal is Active: 123 M 12 S

Temp Deviation to Determine that Condition is True: 12.3

Main Controls 10:19:56 Alarm: Pump Breaker Tripped

Auto Man Time: 123 M 12 S Pre Start Start Finish Ready SSP

SSP1 SSP2 SSP3 SSP4

Upstroke Downstroke

Residual: 1234 al

Valve Chart

Stirring: Auto Man

HEATER: 123.0%

Potential MV: 123.4% PV: 123.4°C SP: 123.3°C

STEP 12 Remaining Time: 12:12

Total: 123:12 Now: 12:12 Rest: 123:12

Commissioning status:

- Liquid addition accuracy

Almost ready

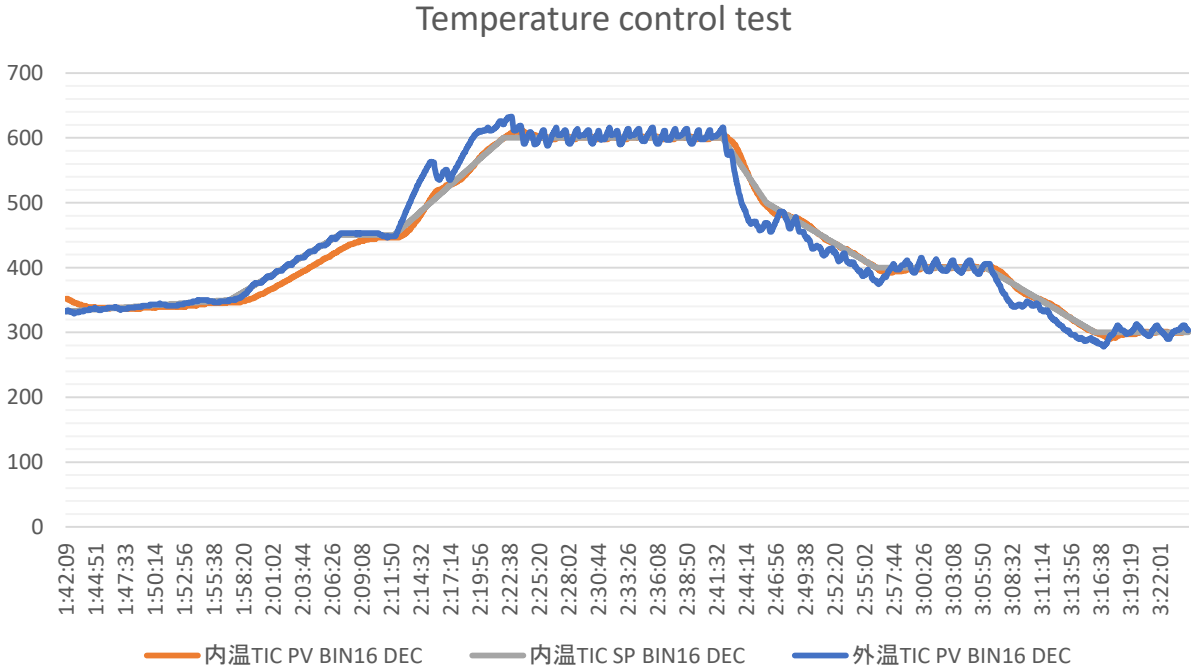
- Temperature control

Just on fine tuning of PID control parameter

- Ag electrode test

Now on checking

300 ml input value	150 ml/min	60 ml/min	30 ml/min
SSP1	300.01	299.90	299.71
SSP2	300.00	299.80	299.81
SSP3	300.06	299.93	299.90
SSP4	299.95	299.93	299.86



Schedule from now

2018

June

- continue the commissioning and fine tuning of parameter
- realistic crystal growth test \Rightarrow AgBr crystal size check
- Preparation of transportation

July

- Transportation
(depends on the situation of commissioning and LNGS facility construction)

August

- start the re-construction of machine \Rightarrow commissioning



Summary

- New production machine is now on constructing. (mostly constructed)
- we started commissioning test and tuning the parameter.
- Now is on schedule, and transportation should be possible end of June or middle of July at latest if no serious trouble.
- Transportation and constructing in underground depend on the situation of new facility