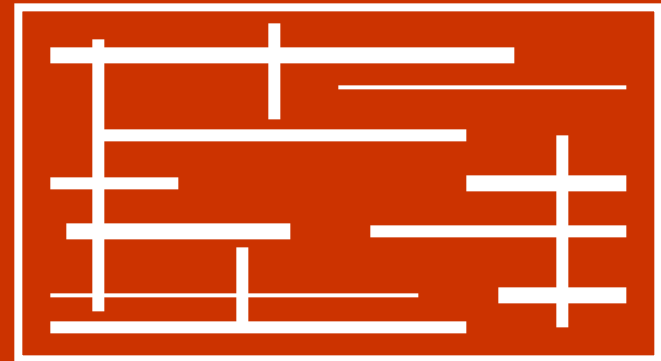


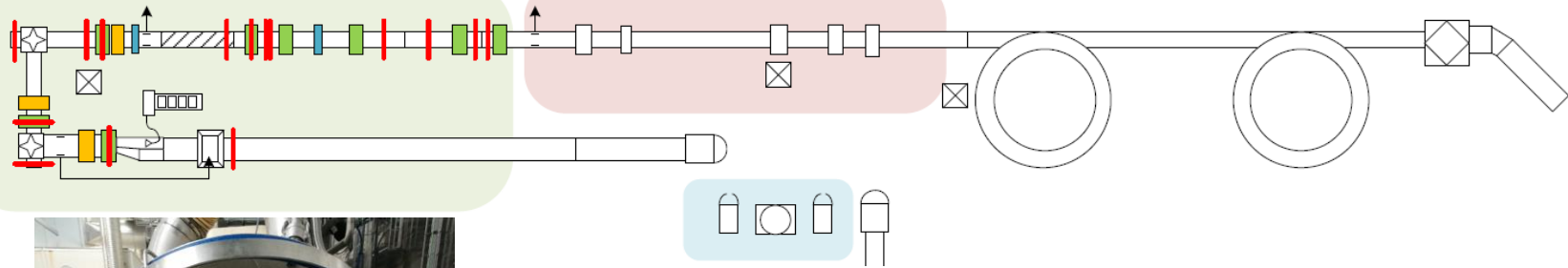
Frans van den Berg  
University of Copenhagen, Faculty of Science  
Department of Food Science  
Ingredients and Dairy Technology section [KU.FOOD.IDT]  
fb@food.ku.dk



Lamination

Make-up

Packaging / Freezing etc.



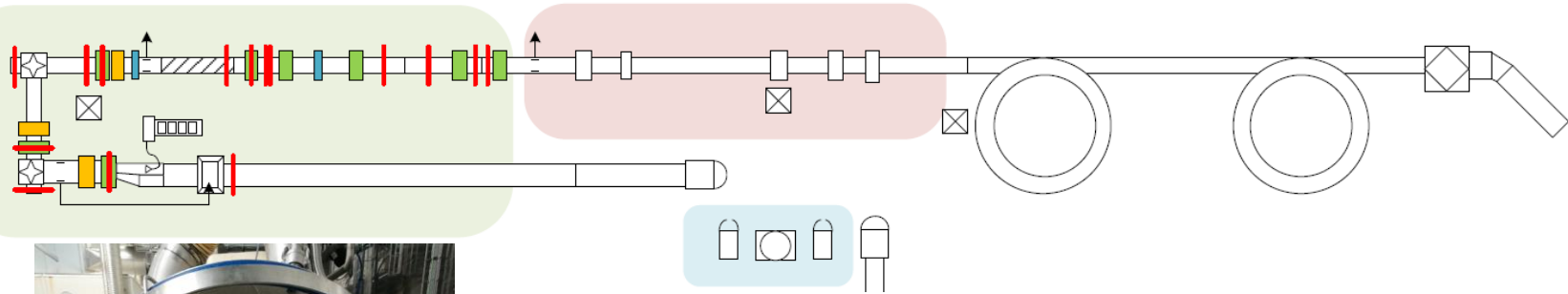
← Dough preparation



Lamination

Make-up

Packaging / Freezing etc.



← Dough preparation



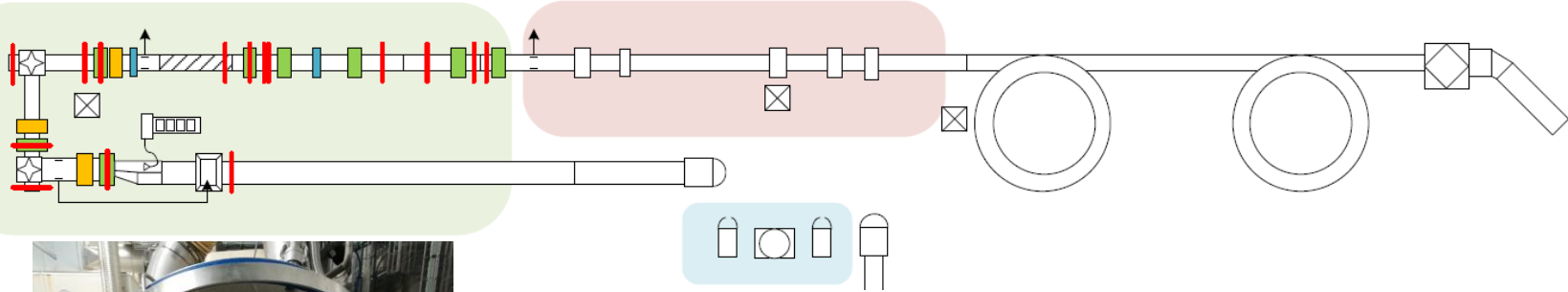
→ dough / butter layering



Lamination

Make-up

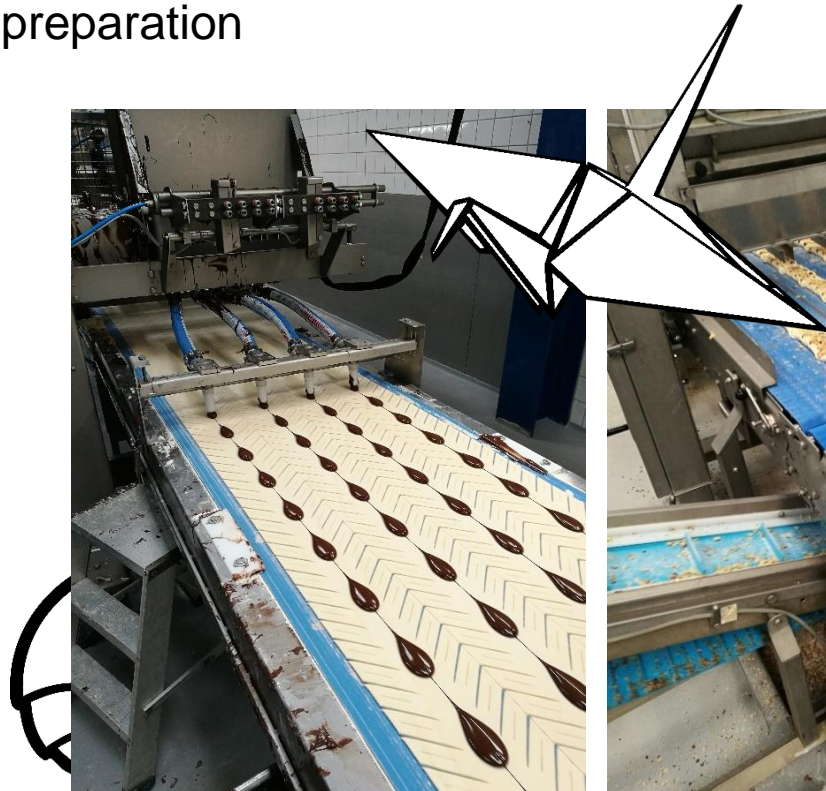
Packaging / Freezing etc.



← Dough preparation



→ dough / butter layering

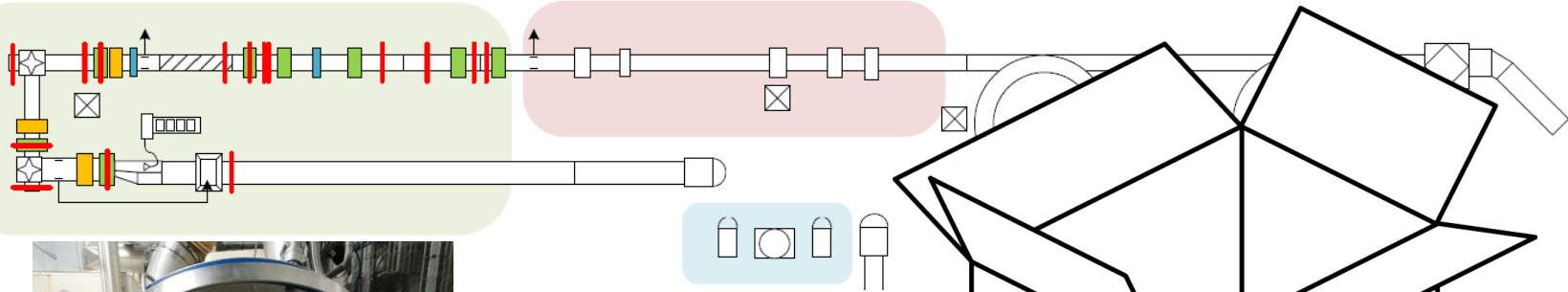




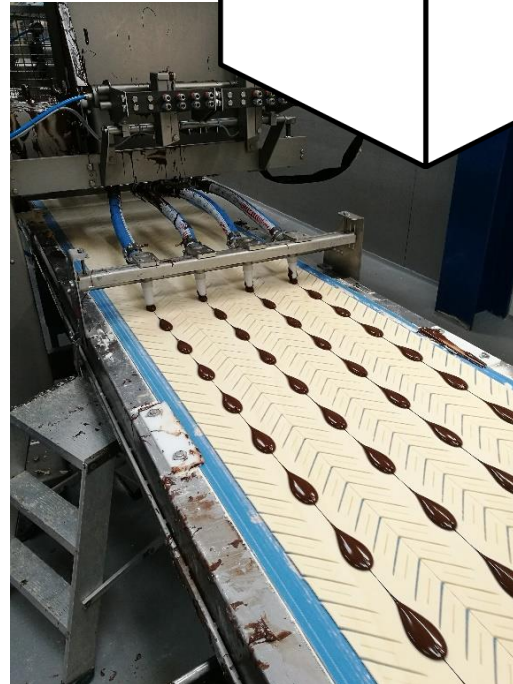
Lamination

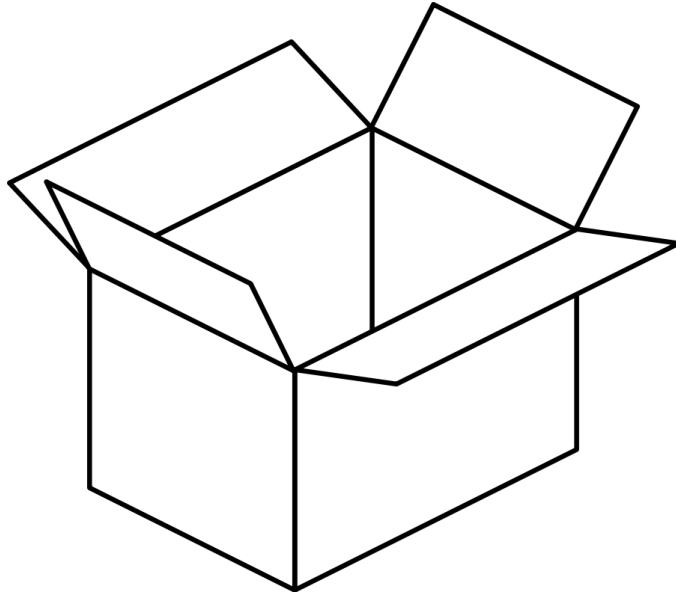
Make-up

Packaging / Freezing etc.

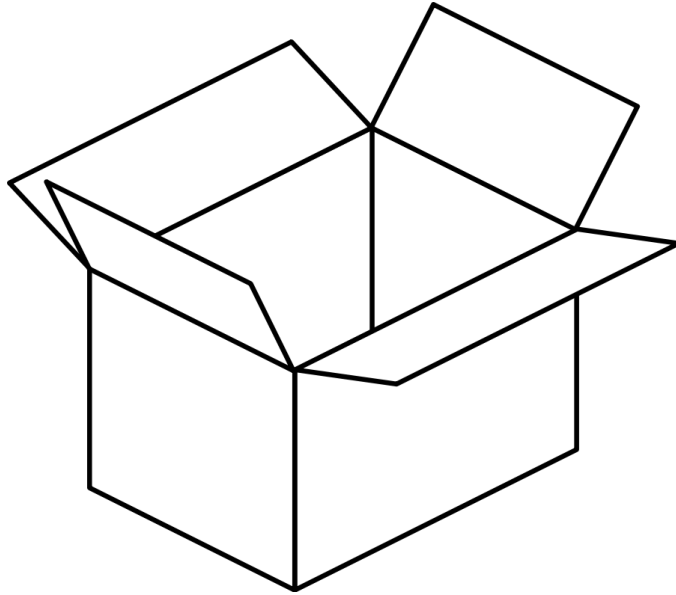


← Dough preparation





- We want to know if batches of dough (“Lot numbers”) give the same (average) weight pastries.
- We can test a number of boxes from one Lot number.
- The **standard test** consist of **weighing 4 (baked) pastries**, randomly selected, and we can thus perform a number of standard tests from one box. (One box contains  $4 \times 4 \times 3 = 36$  pastries.)<sup>\*</sup>



- Using a **box** opened for testing carries a **cost 75DKK** (product loss)\*. **Labour costs** for one standard test is **100DKK**\*. Please keep track of and report the total cost of your investigation.

- To run the simulations you need download two small scripts from Absalon, Assignment\_05.
- The results per Lot number (batch of dough) will be saved as Excel file (CSV format).



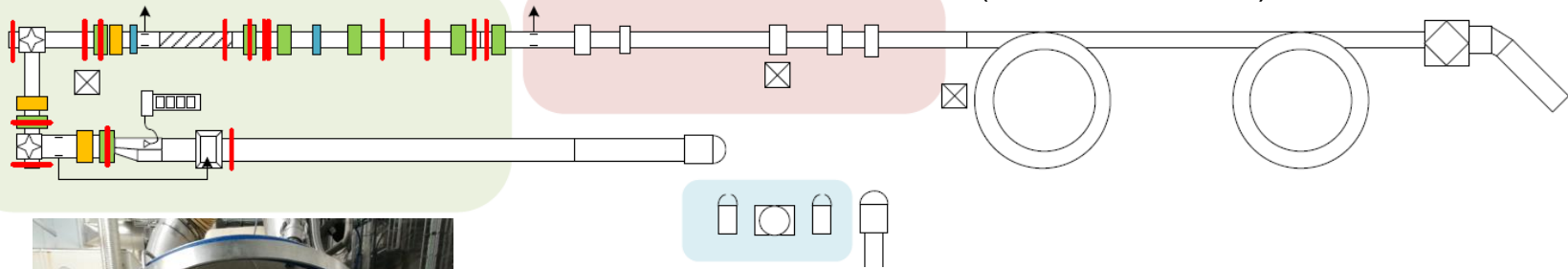
1. **Your task is to investigation the system, not using too much money!**
2. Reporting should be done in the same fashion as in previous assignment.
3. E-mail me your findings, preferably before Friday October 11, 2024.  
*Please use your initials in both the excel file and the Python script to make sure that everybody can easily run the code.*



Lamination

Make-up

Packaging / Freezing etc.  
(→ RTD ~3X min.)



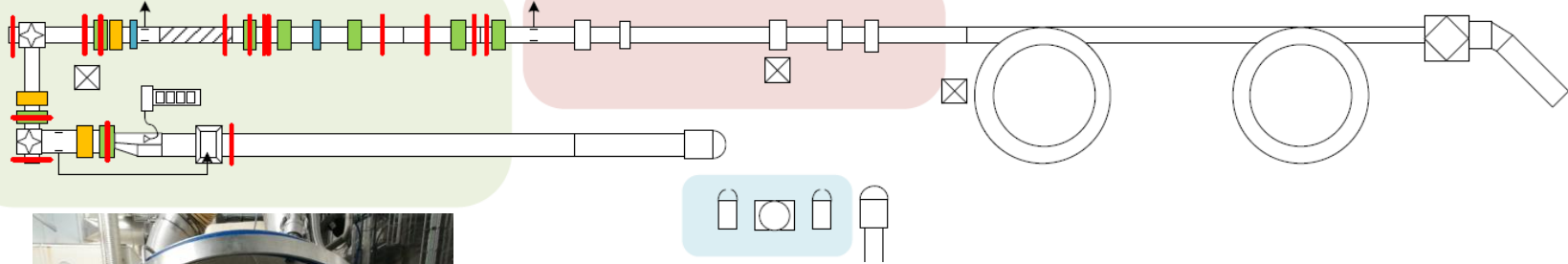
← Dough preparation  
(~ every X minutes)



Lamination

Make-up

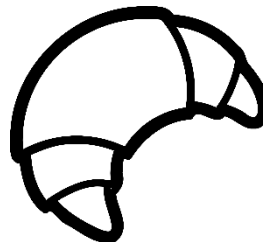
Packaging / Freezing etc.  
(→ RTD ~3X min.)



← Dough preparation  
(~ every X minutes)



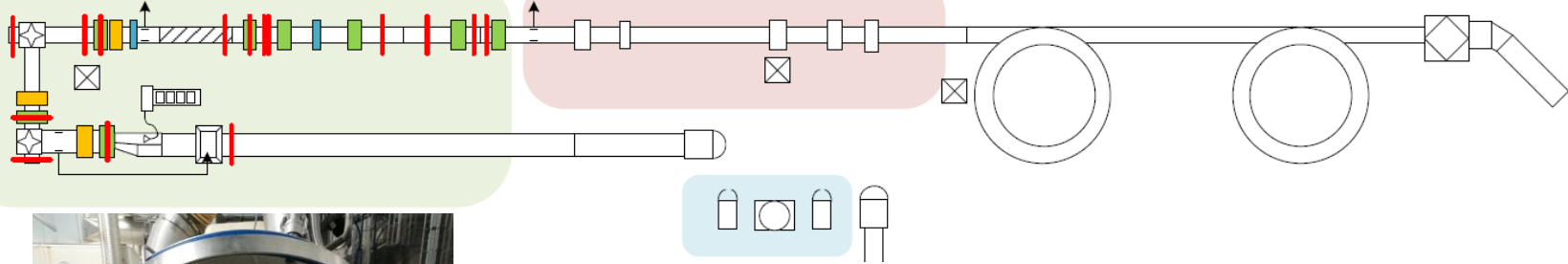
→ dough / butter layering



Lamination

Make-up

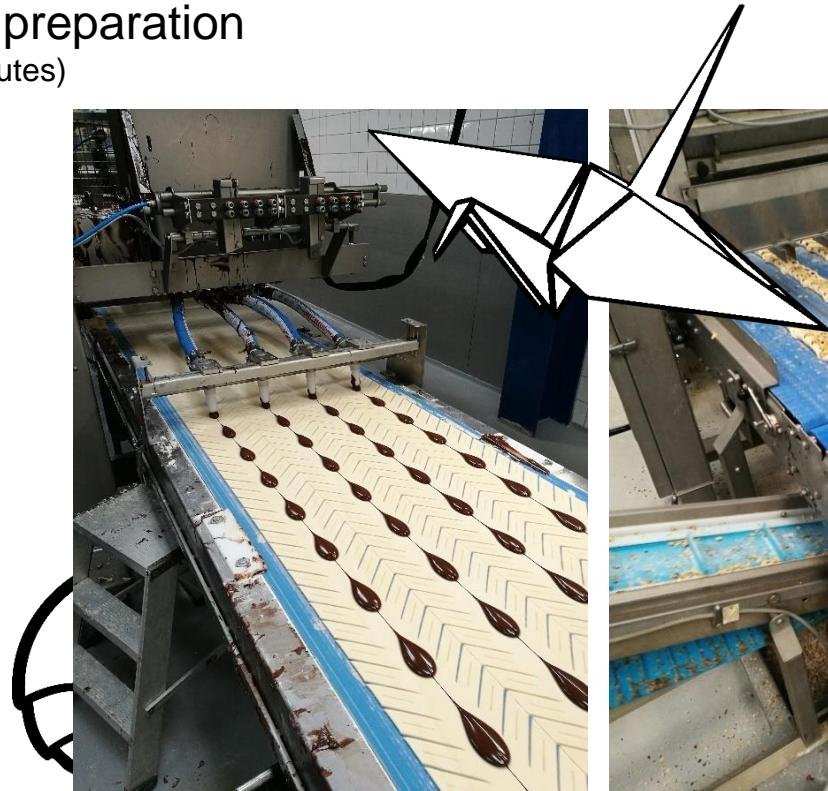
Packaging / Freezing etc.  
(→ RTD ~3X min.)



← Dough preparation  
(~ every X minutes)



→ dough / butter layering

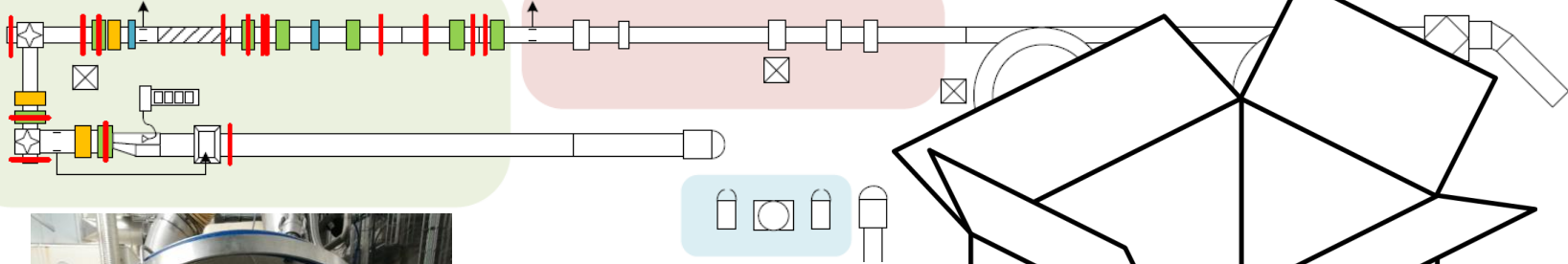




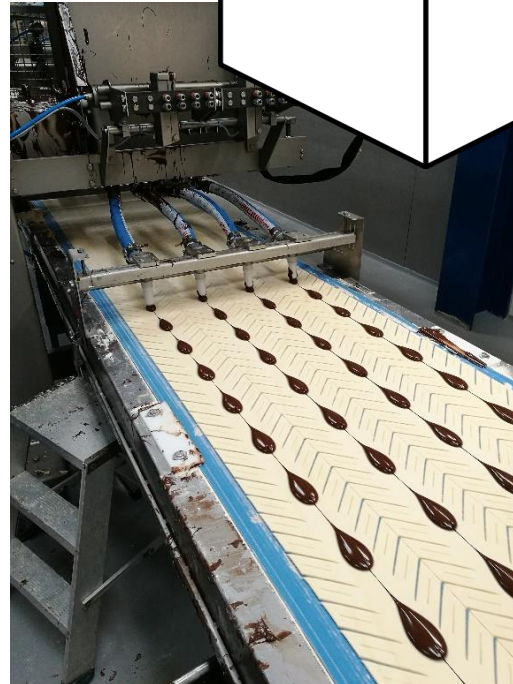
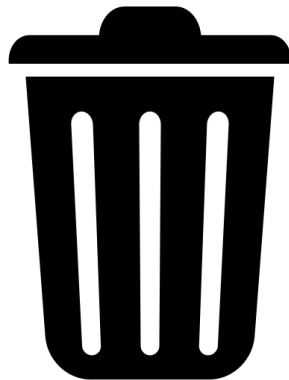
Lamination

Make-up

Packaging / Freezing etc.  
(→ RTD ~3X min.)



← Dough preparation  
(~ every X minutes)



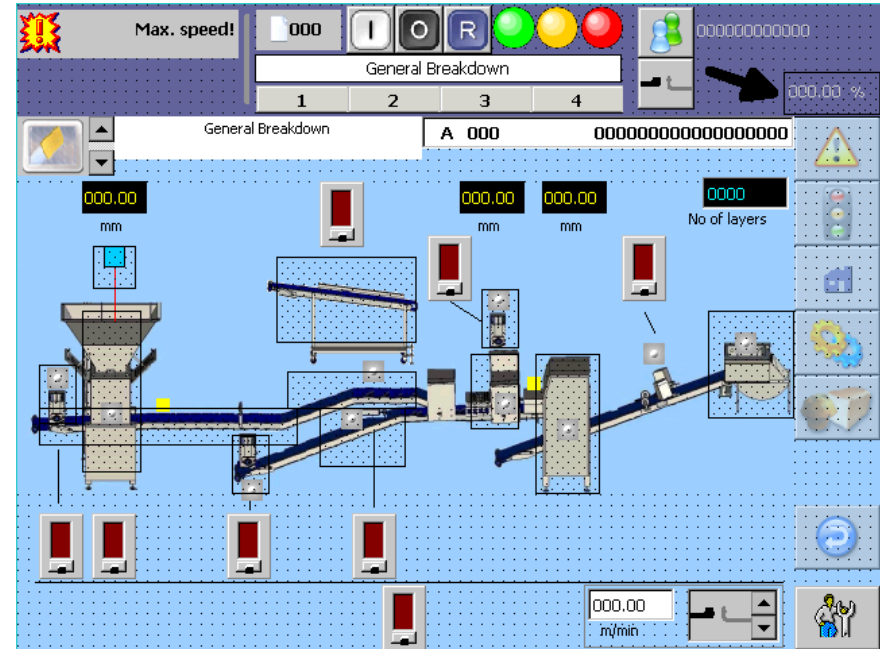
## One production year, one production line

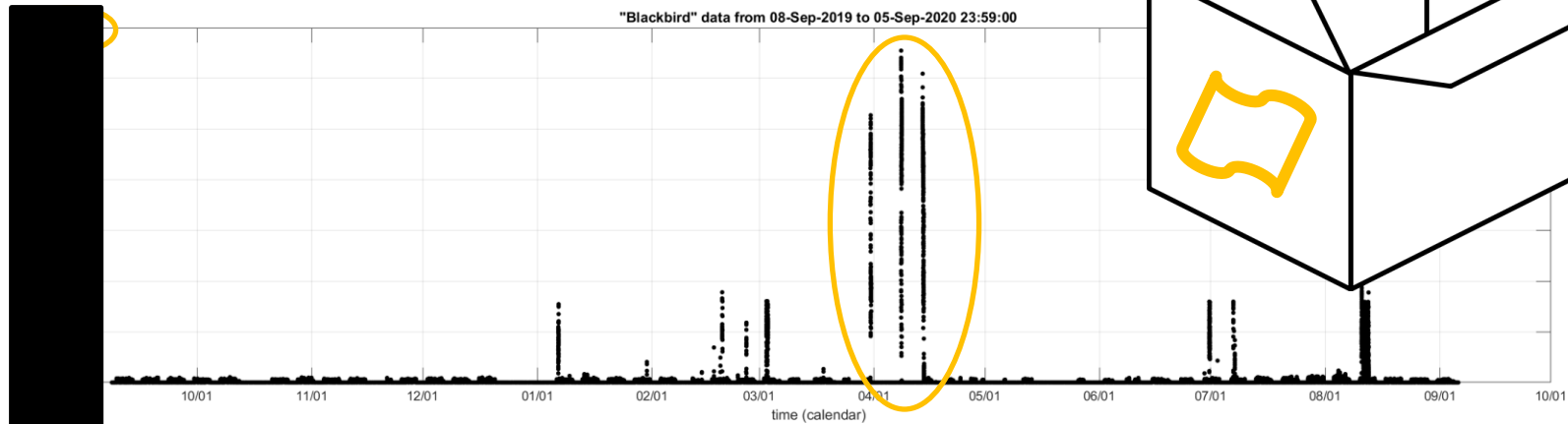
589,509,279  
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 927,104,763  
 472,092,704  
 973,151,727  
 4,121,007,099  
 5,348,004,810  
 3,992,277,833  
 706,221,490

...rs.csv  
 ...SV  
 ...V  
 ...CSV  
 ...er.csv  
 ...V  
 ...G.csv  
 ...Q.csv  
 ...e.csv

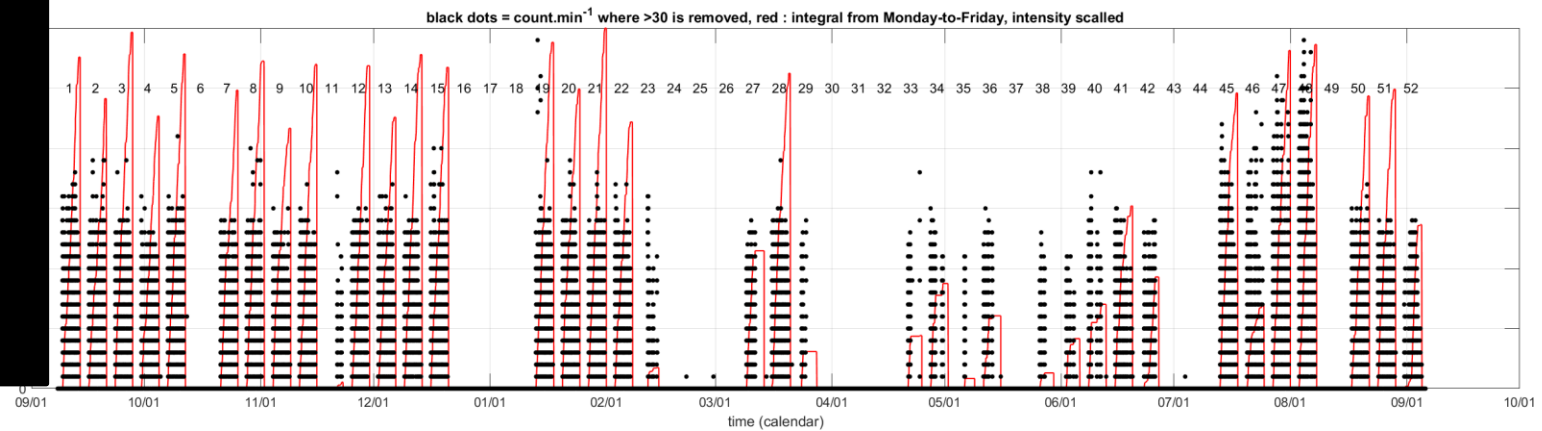
13 Files

24,058,042,503 bytes  $\approx$  24GB

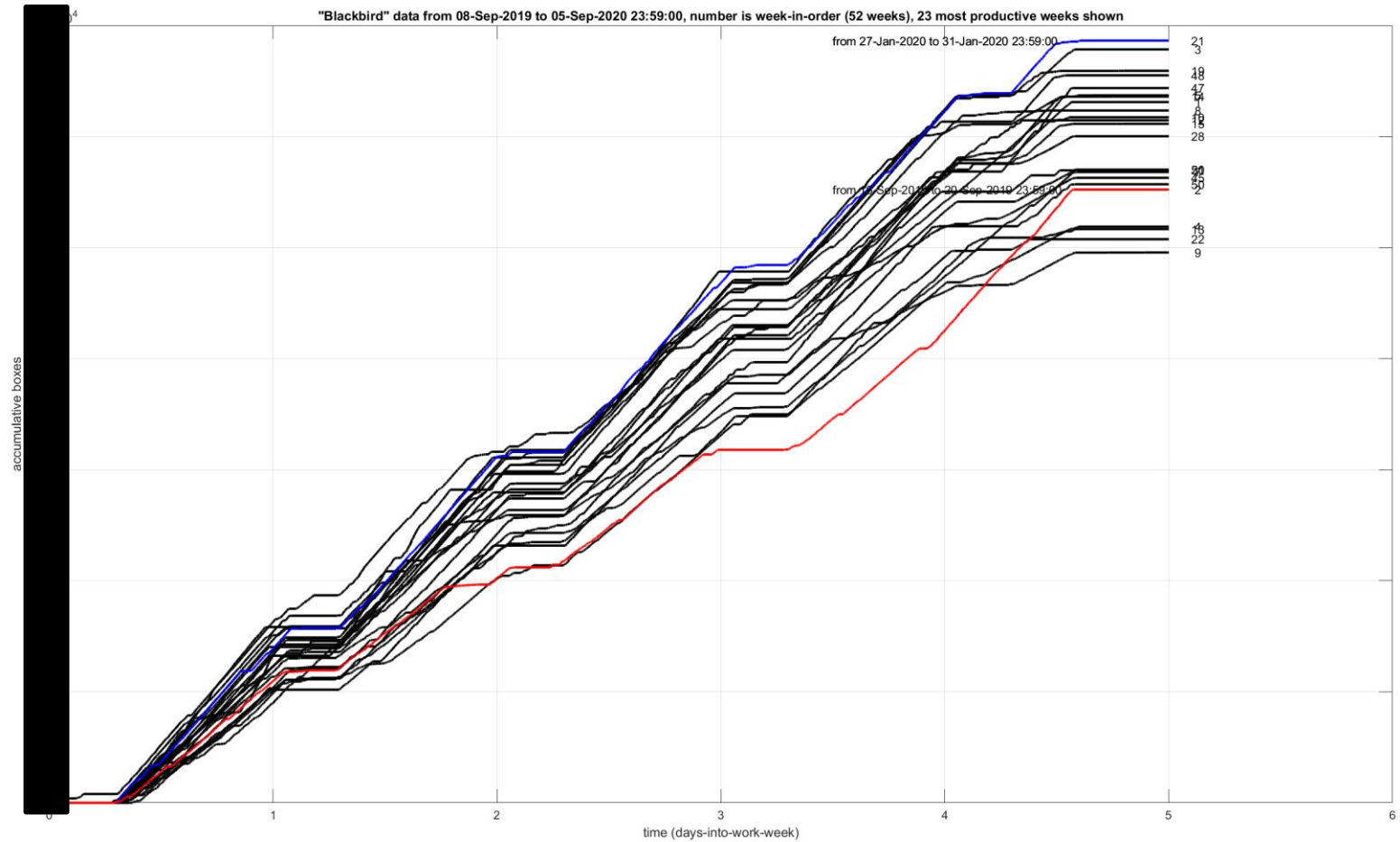




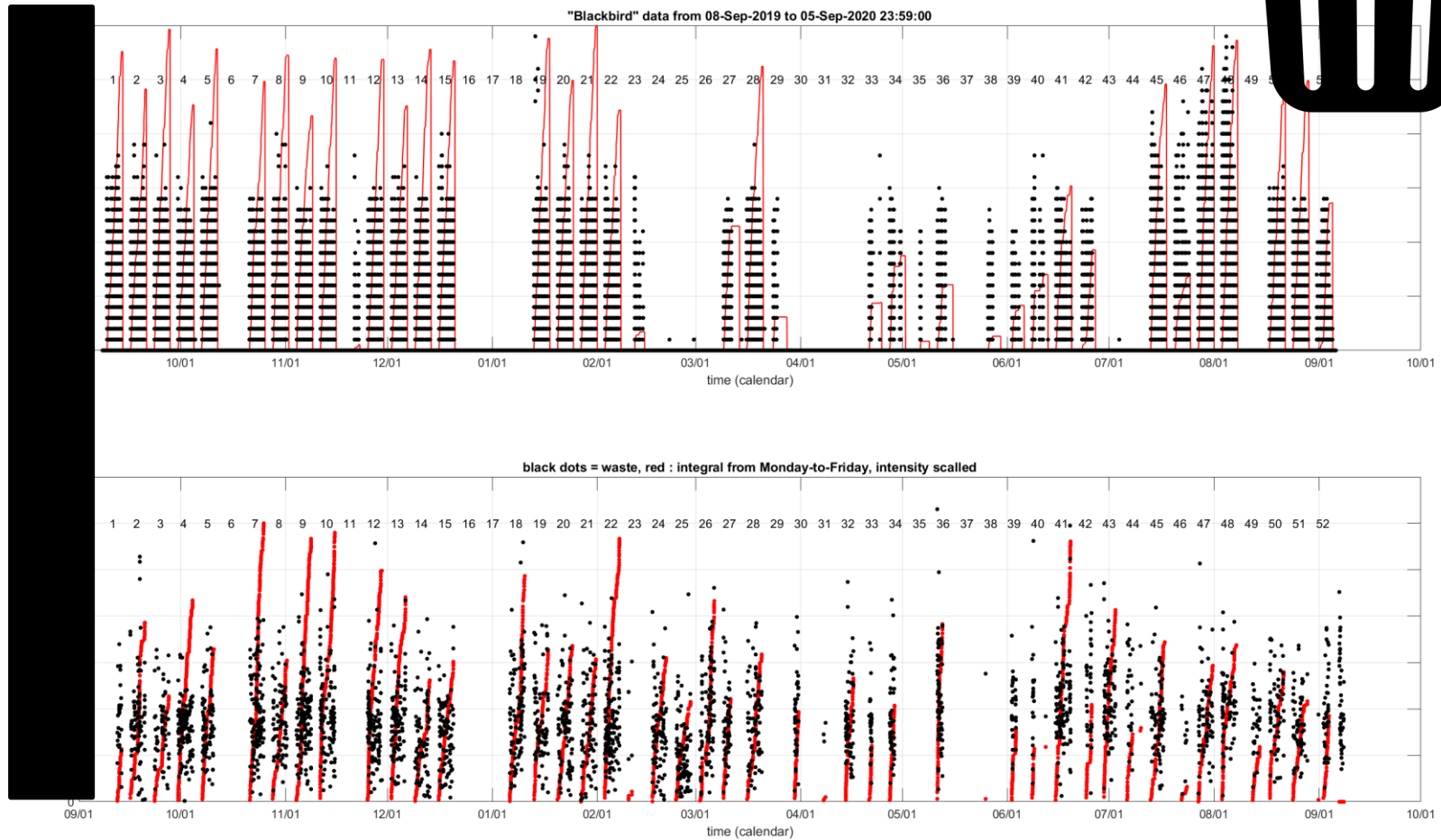
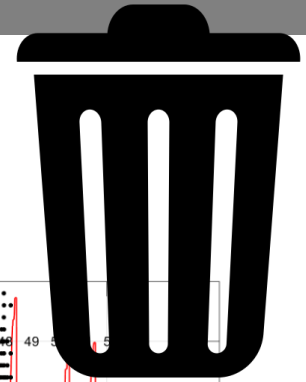
## Boxes of product per minute ...



## Boxes per work-week (5 days, 24h)

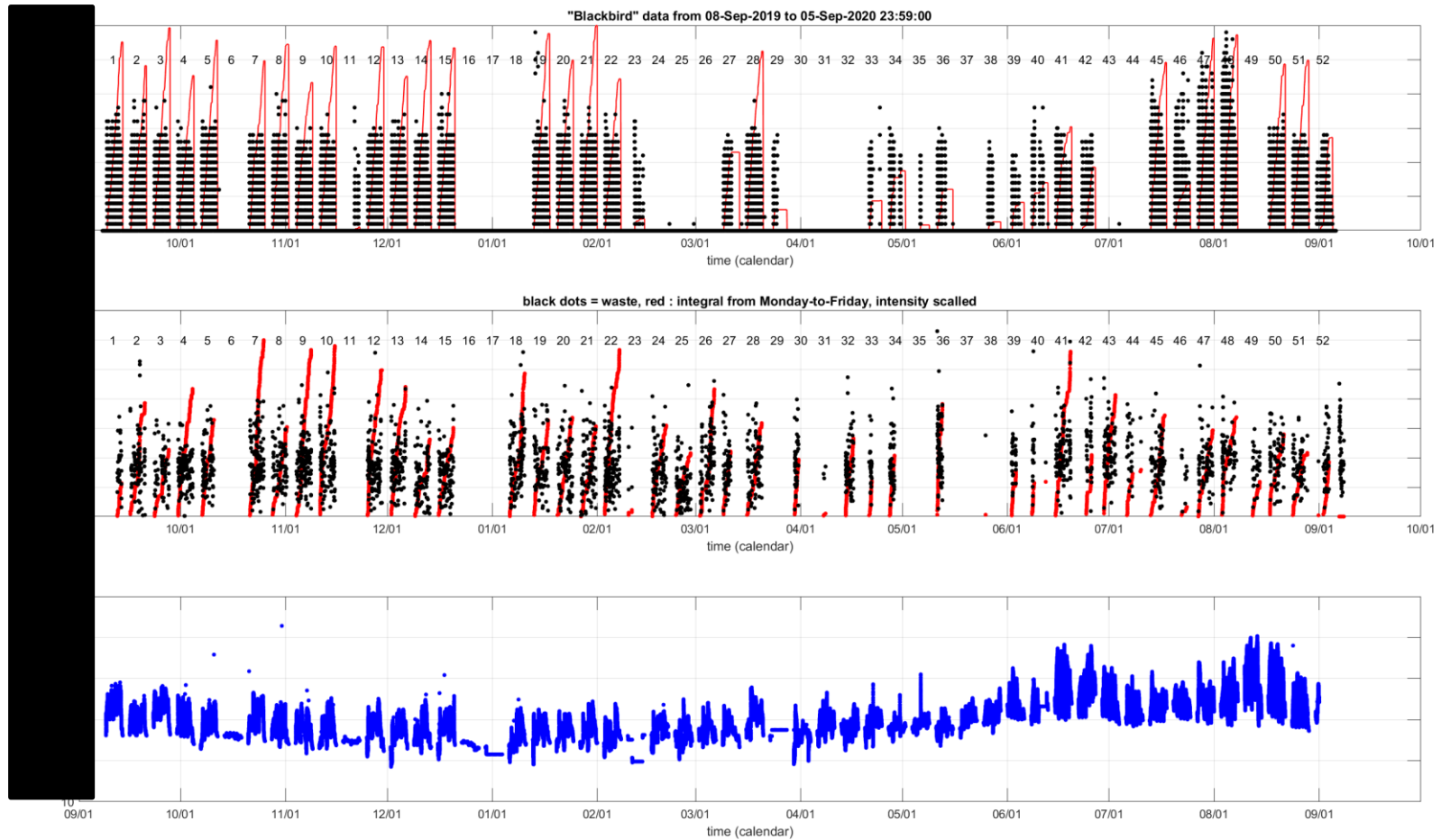


Work-week trends

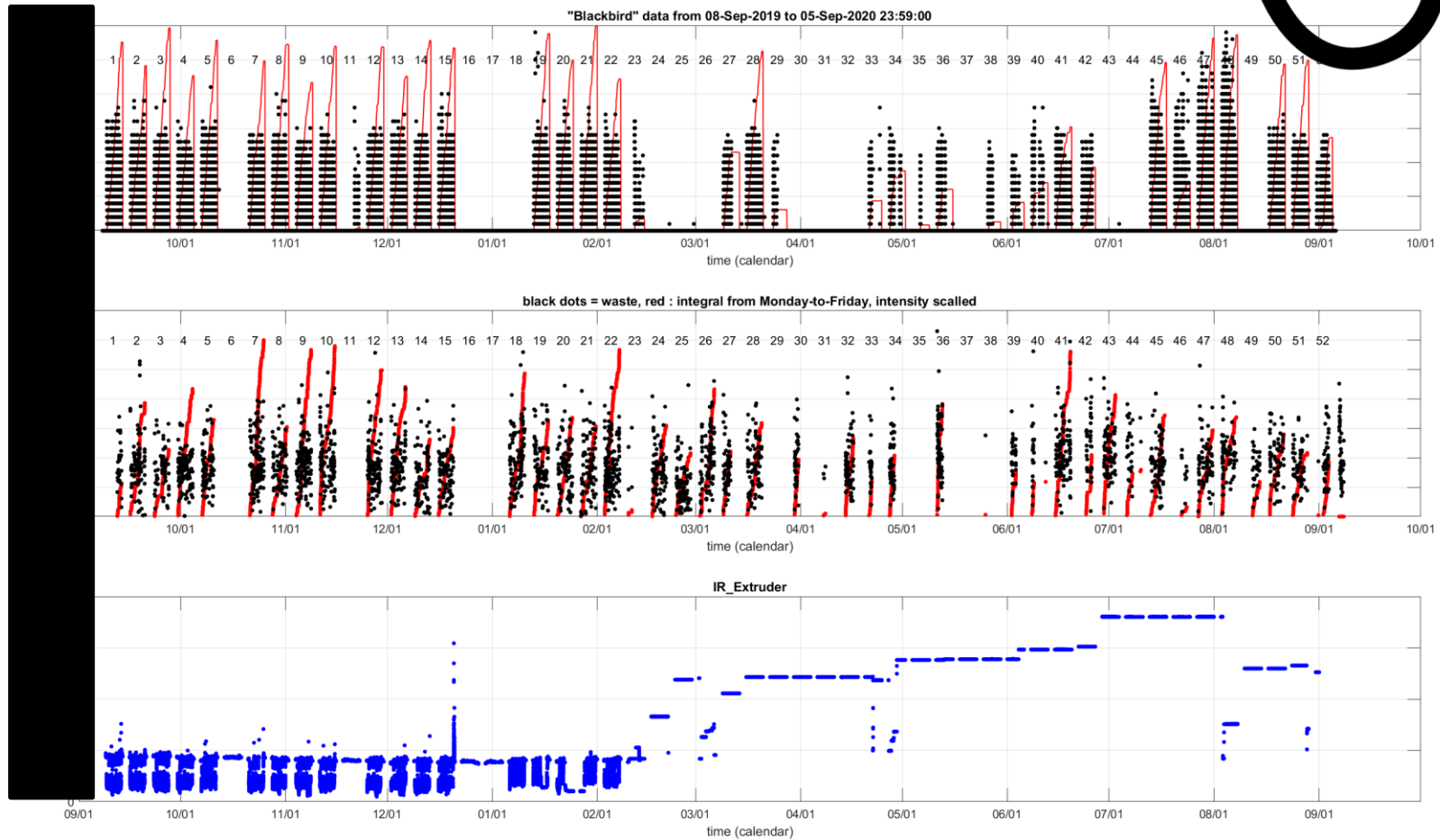
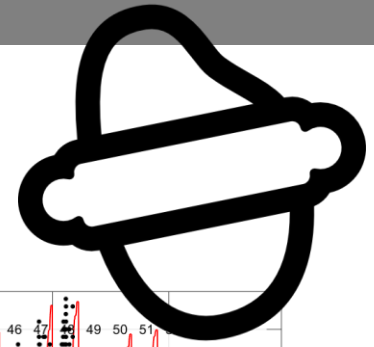


Loss per work-week

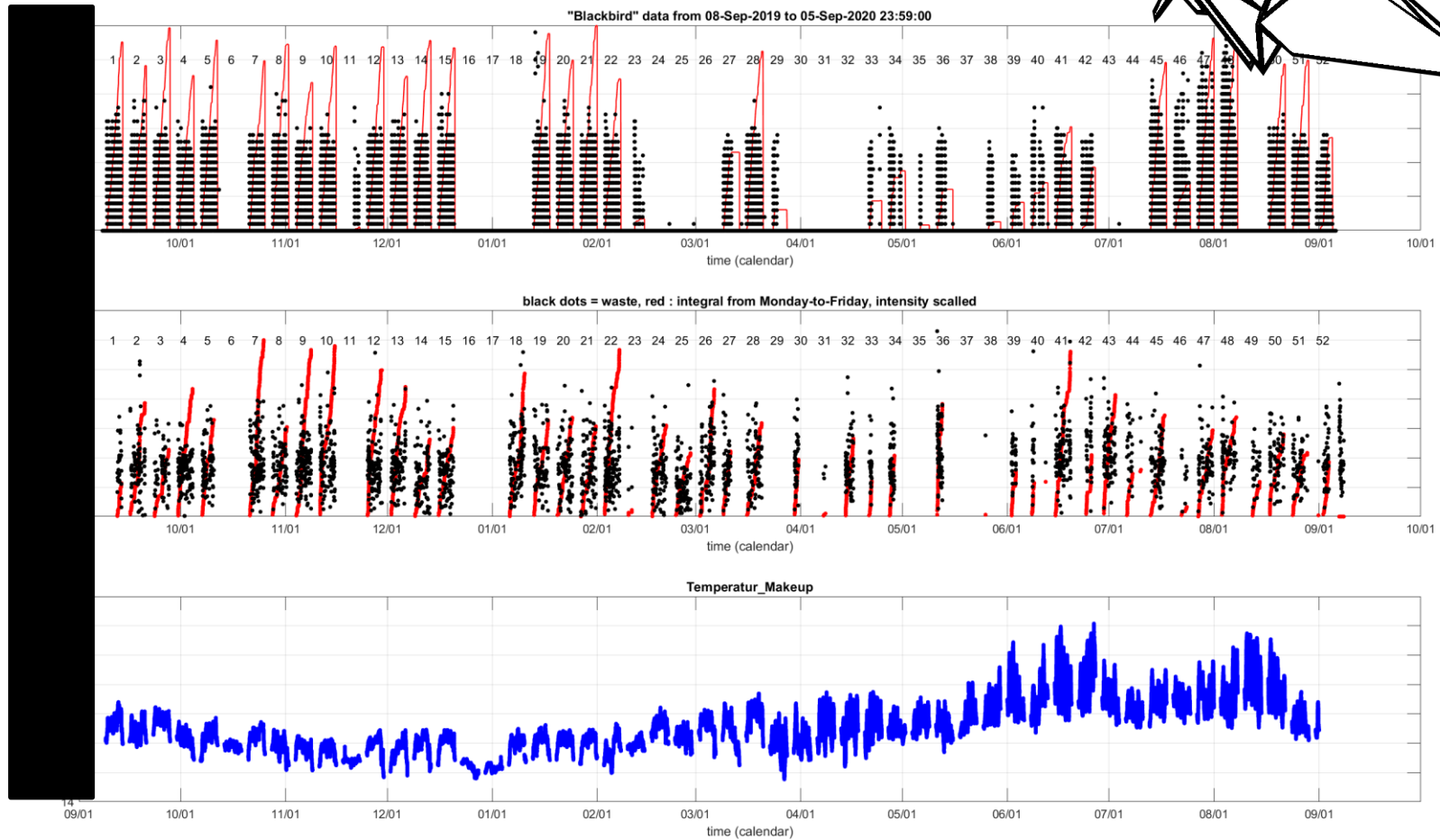




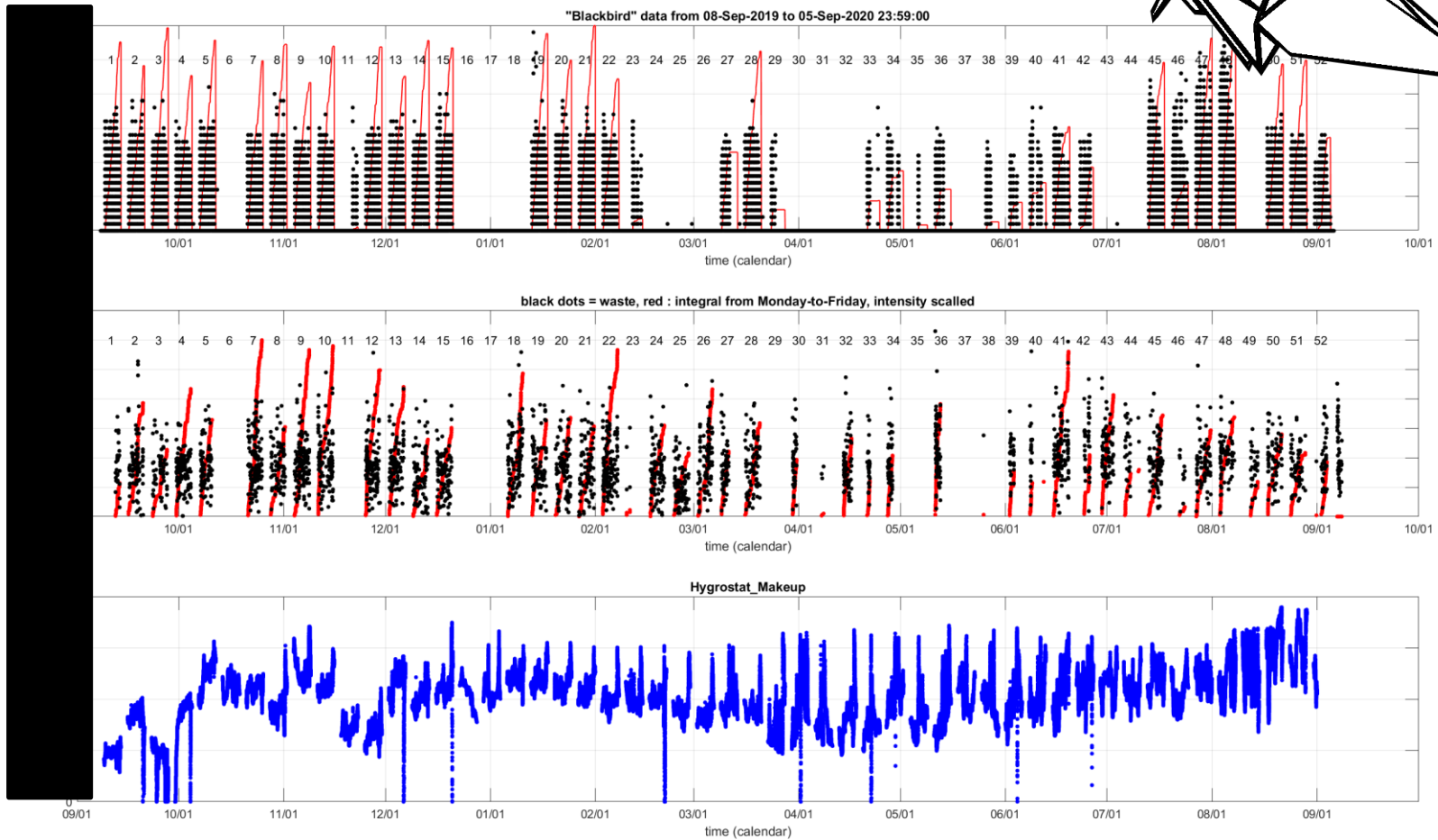
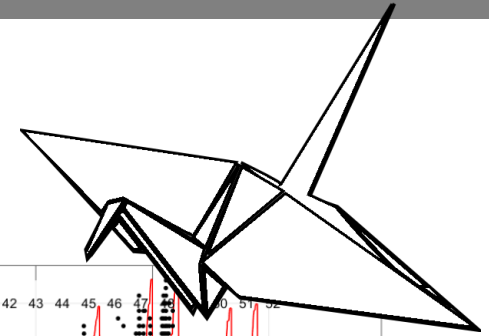
Temperature Flour (ingredient to mixers or used during lamination?)



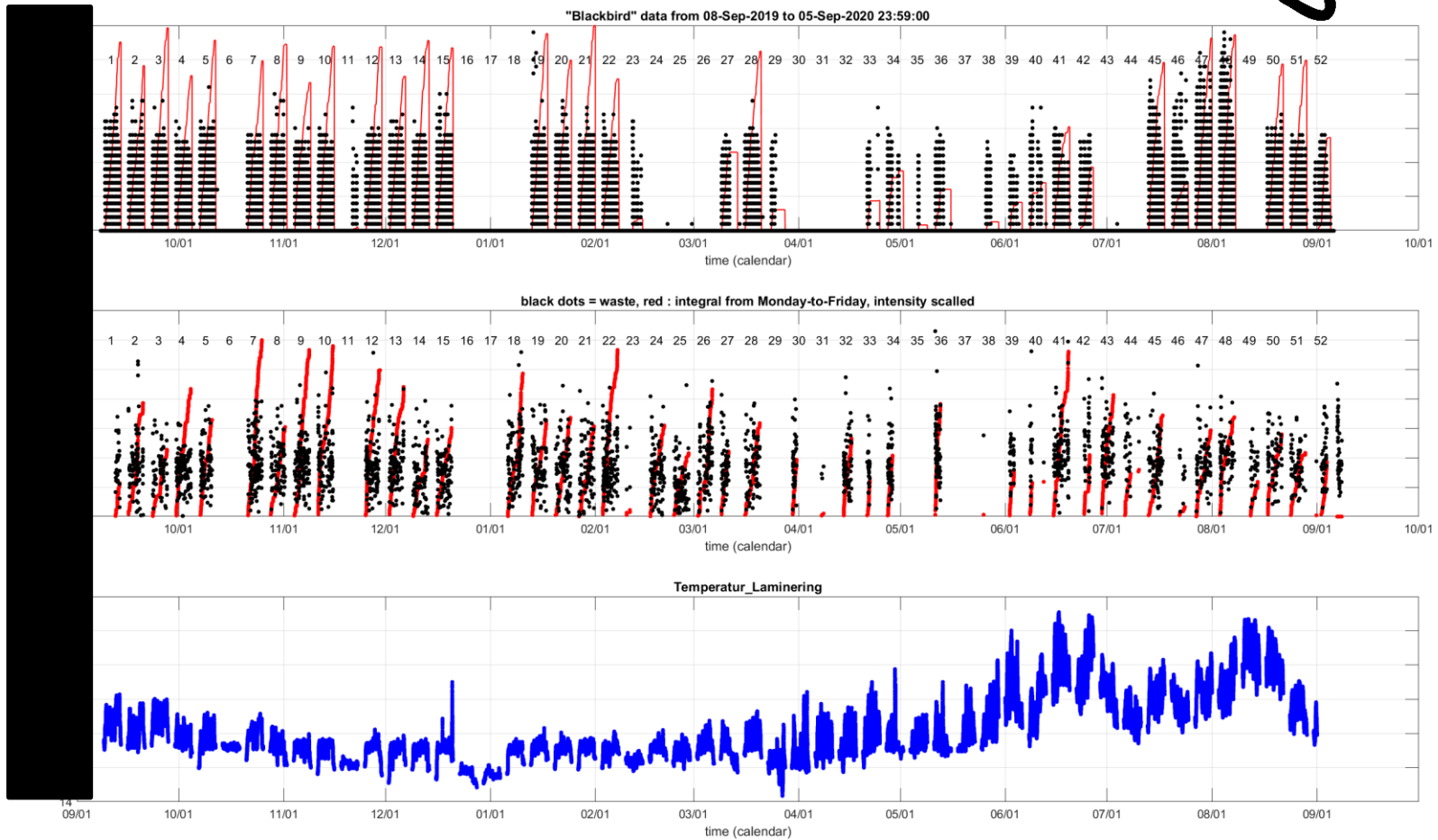
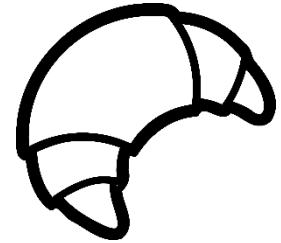
Temperature Extruder (from mixer to first layer ~ “dough pin”)



Temperature Make-up

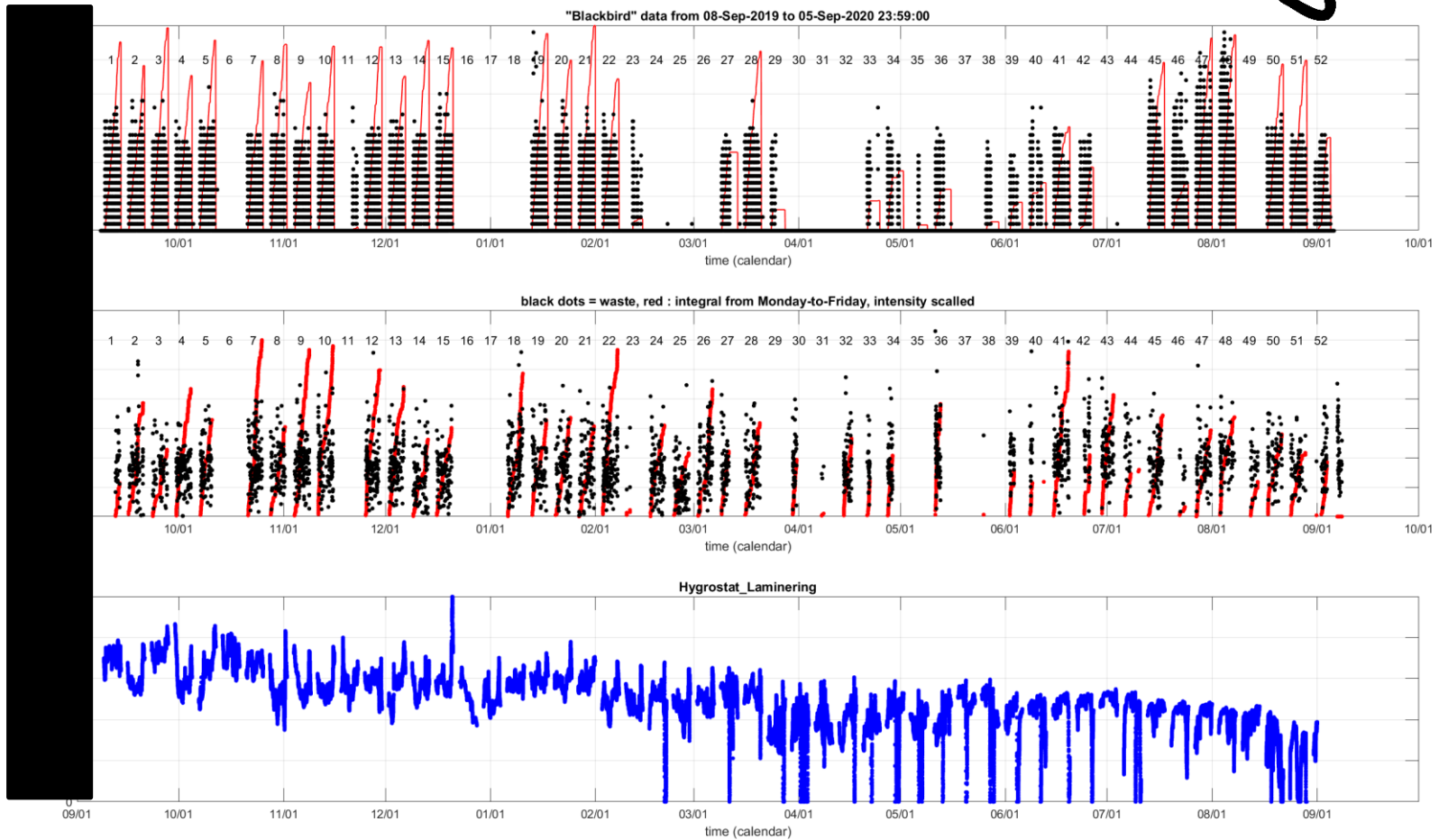
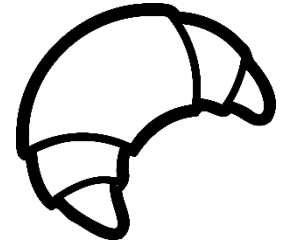


Humidity Make-up



Temperature Laminate





Humidity Laminate

