# IT'S ALL ABOUT PREINFUSION

BASIC PRINCIPLES – ADVANCED DECENT PREINFUSION – PCT RATIO

STÉPHANE RIBES – MAY 2019

# ESPRESSO PREINFUSION SUMMARY (1/2)

- Perfect preinfusion consists in instantaneous and even wetting of the coffee grinds. Its outcome is a totally wet puck, with even temperature and compression.
- From the brewing perspective, a more even preinfusion improves coffee extraction and taste

- In the traditional espresso process where water hits the coffee puck from only 1 direction, with no stirring possibilities, targeting a perfect preinfusion is obviously a challenging objective!

- We have assessed the influence of the water flow during espresso preinfusion, considering the following characteristics:
    1. Consistency of the puck density after preinfusion
    2. Homogeneity of the Puck Contact Time with brew water and of the puck temperature
    3. Smoothness of the puck surface after the espresso shot

- What's presented here is a mix of basic observation results and hypotheses based on expected physical phenomena

# ESPRESSO PREINFUSION SUMMARY (2/2)

- With the Decent Espresso machine, espresso preinfusion can easily be adjusted and **perfected**

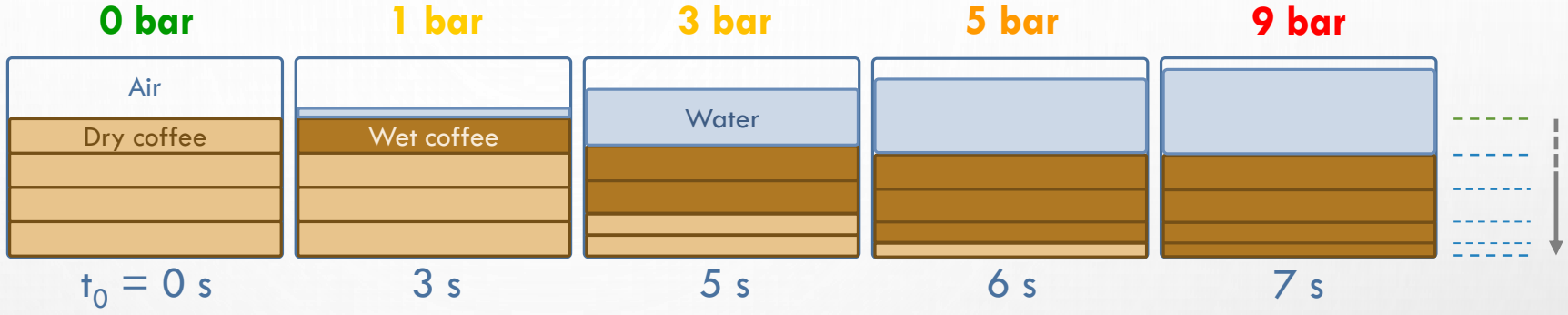
| | **Constant preinfusion flow rates** | | | | **Variable preinfusion flow rate** |
|---|---|---|---|---|---|
| | Very low flow (0.5 – 1.5 mL/s) | Low medium (1.5 – 3.0 mL/s) | Medium high (3.0 – 5.0 mL/s) | High flow (5.0 – 8.0 mL/s) | |
| 1 Even puck compression | ++ | + | – | – – | + |
| 2 Even Puck Contact Time & Temp. | – – | – (+ with low extraction flows) | + | – (+ with high extraction flows) | + |
| 3 Even puck surface | – | + | + | – | + |

# ESPRESSO PREINFUSION
# WHAT'S BEST FOR MY COFFEE?

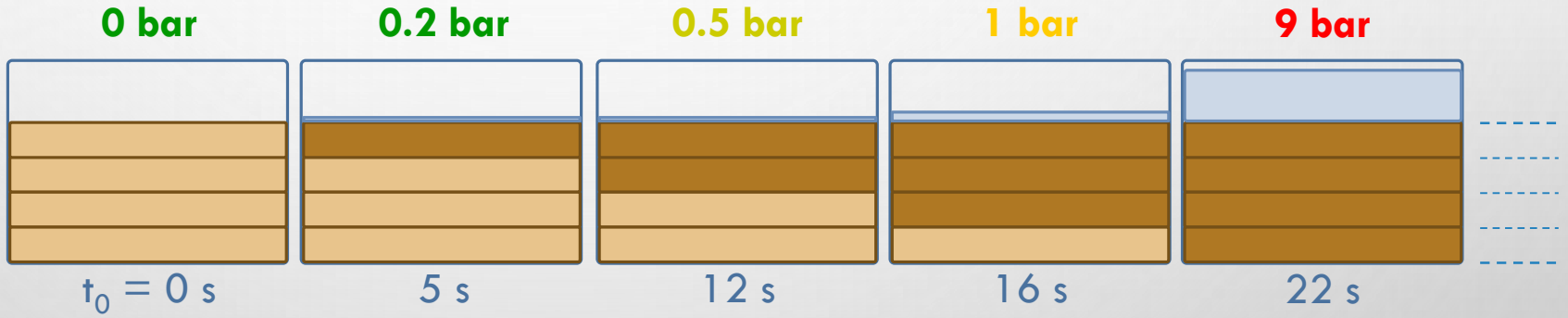
- Benefits of a given flow rate for preinfusion often seem to be offset by other negative effects
- A universal compromise working best in all situations may not be possible – the most suitable target may vary depending on coffee, technique and expectations in terms of taste, mouthfeel…
- For example very slow preinfusions ("Slayer shots") can undoubtedly lead to delicious espresso coffee, especially with light roasts, despite a huge difference in contact time for the top and bottom grinds: maybe in this case more time for the coffee to get fully wet and dwell evenly (also due to low puck compression) brings more benefits than a more even contact time would offer

# ESPRESSO PREINFUSION
# 1 EVEN PUCK DENSITY (1/3)

Quick preinfusion
(e.g. 8 mL/s)

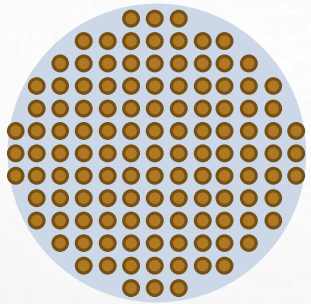
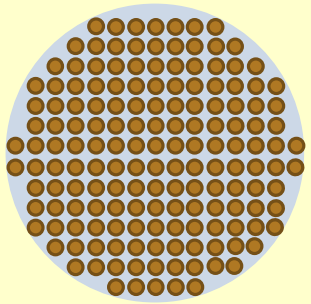
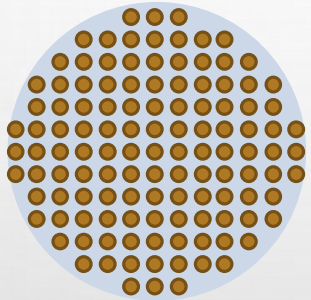
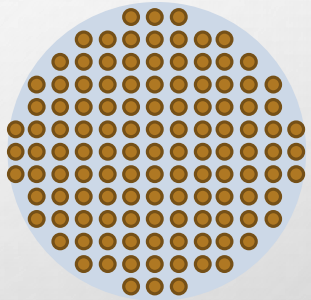



Slow preinfusion
(e.g. 2 mL/s)




- During preinfusion with a quick pressure increase the bottom layers of the puck are more compressed
- **The puck density is more homogenous when a slow preinfusion is performed**
- This explains why, with the same grind size, dose and extraction pressure (e.g. 9 bar), higher flow rates during preinfusion induce lower flow rates during extraction (with longer preinfusion a finer grind is needed to get similar flow during extraction)

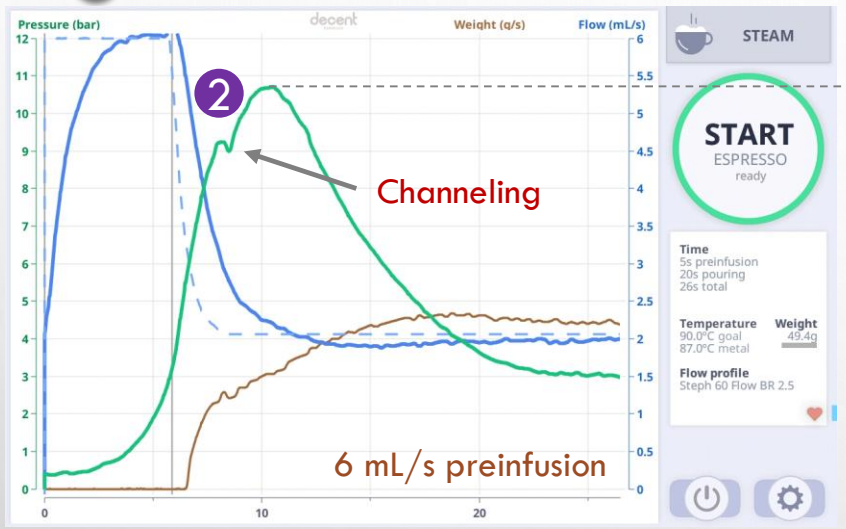
# ESPRESSO PREINFUSION
# ❶ EVEN PUCK DENSITY (2/3)

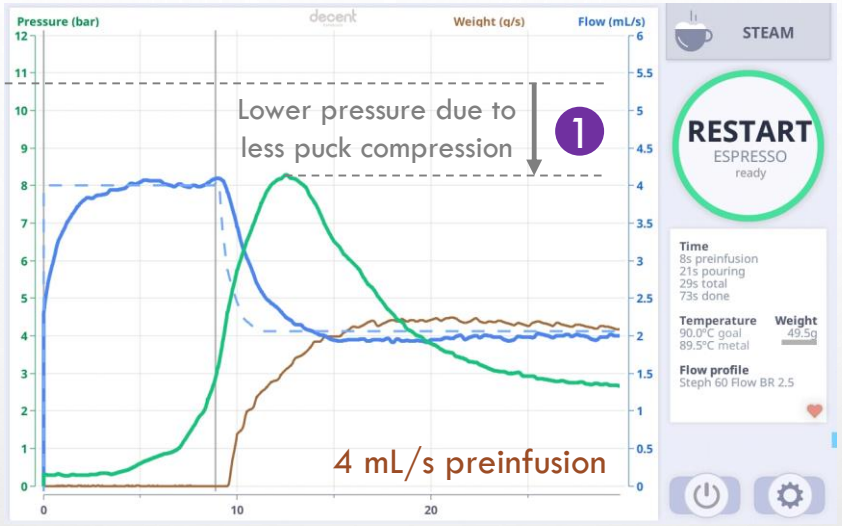
| | Top layers of the puck | Bottom layers of the puck |
|---|---|---|
| Quick preinfusion (early pressure rise) |  |  |
| Slow preinfusion (later pressure rise) |  |  |

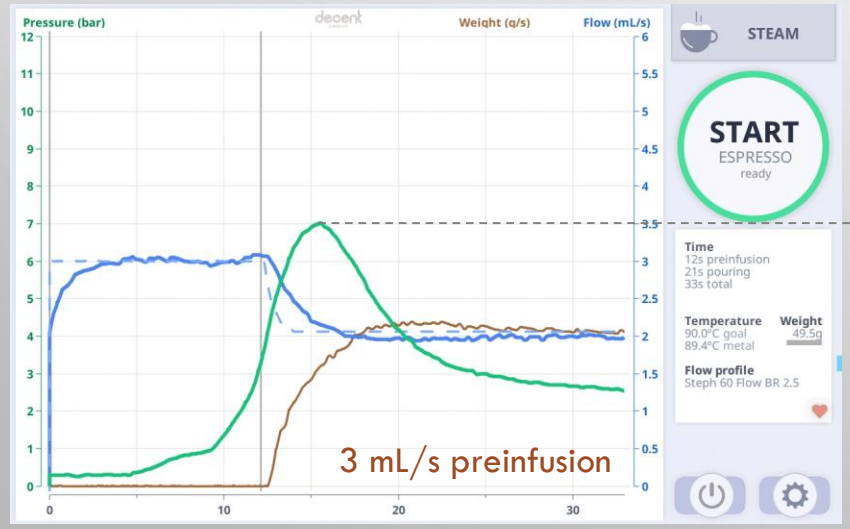
Higher density of coffee grinds

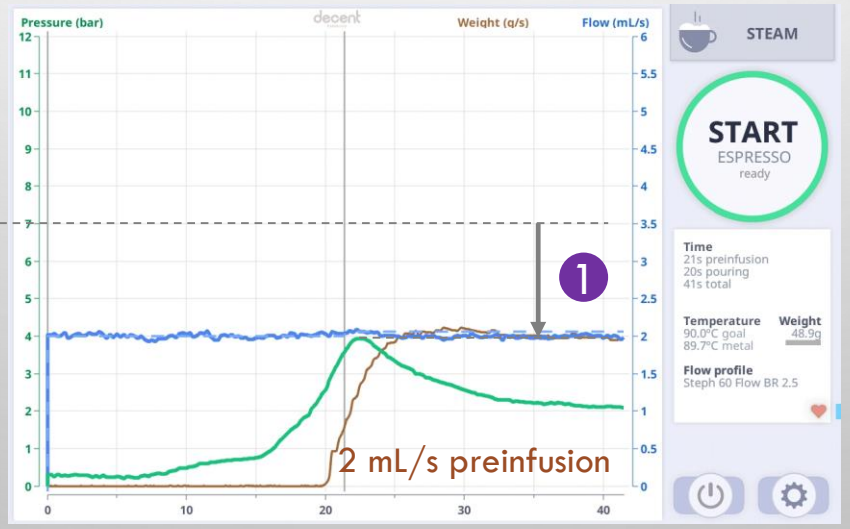
- Higher puck density → less available space for water around the coffee particles
- In the case of a quick preinfusion, the **fluid velocity is higher around the coffee grinds at the bottom of the puck.** The resulting shorter contact time suggests a **lower extraction of the coffee grinds from the bottom of the puck.** This could also contribute to increase the likelihood of messy sprays that can sometimes be seen at the exit of the basket, especially when combined with high extraction flow rates.

# ESPRESSO PREINFUSION
# ❶ EVEN PUCK DENSITY (3/3)




❶ With the same grind size and targeted flow rate for the extraction phase, **decrease the preinfusion flow rate reduces puck compression with direct impact on the maximum pressure reached during extraction (flow profile)**

❷ Channeling can occur when a high preinfusion flow rate is combined with a steep pressure increase

Evidence of channeling?

# ESPRESSO PREINFUSION
# ❷ EVEN CONTACT TIME & TEMPERATURE (1/7)

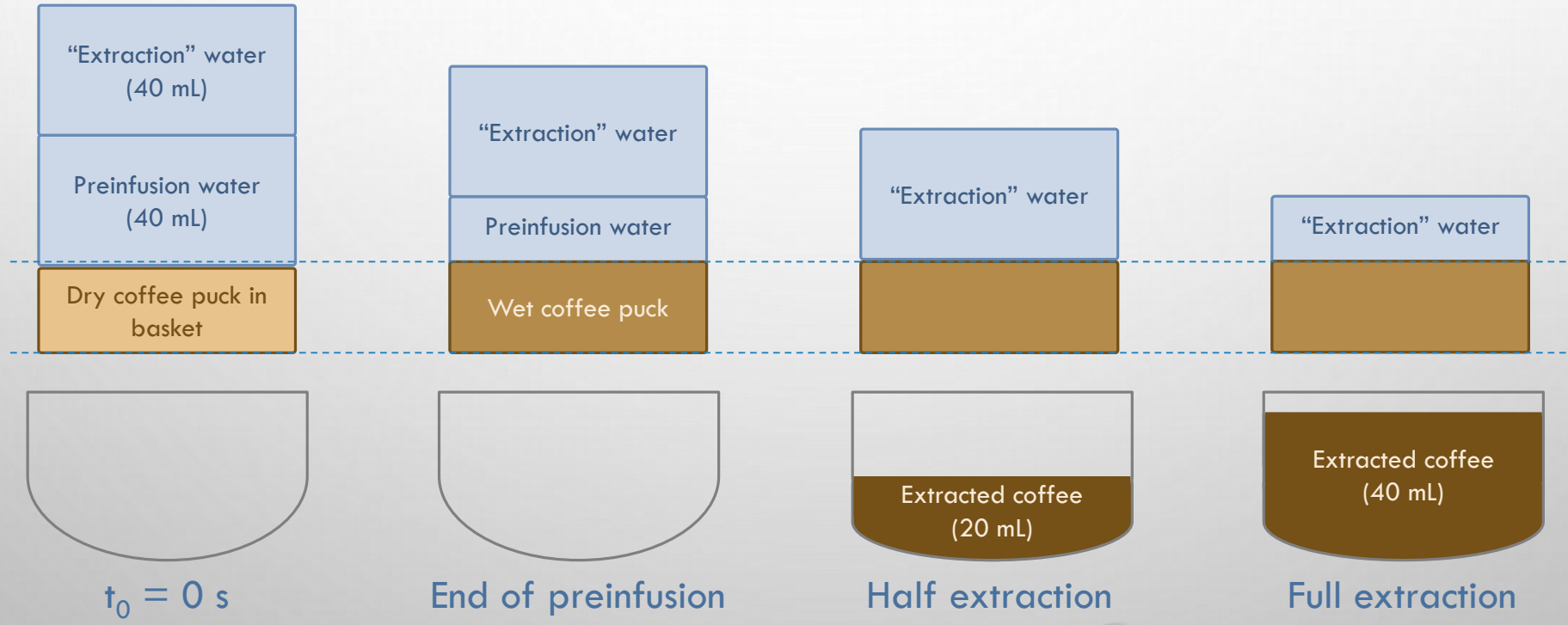
- **With the Decent Espresso machine, a 20 g coffee dose requires ca. 40 mL of water to perform full preinfusion** (DE1 PRO v1.1 machine – 20 g of coffee in a 18 g basket)

| Preinfusion flow | 1.0 mL/s | 2.0 mL/s | 4.0 mL/s | 8.0 mL/s |
|---|---|---|---|---|
| Preinfusion duration | 40 s | 20 s | 10 s | 5 s |

- With a 1 mL/s preinfusion, when the coffee grinds at the bottom of the basket get wet, those from the top of the puck have already been soaked in hot water for 40 seconds!
- This additional contact time of the top grinds will be partly (or even fully) compensated at the end of the extraction when the last amount of brewed coffee will pour out of the basket. This amount corresponds to the volume of residual fluid in the puck in the last stages of the extraction.
- **The ideal balance (same contact time for top and bottom grinds) is obtained when the time to pour the residual brew water equals the preinfusion time**
- This can be achieved thanks to appropriate selection of flow rates for preinfusion and for the (last step of the) extraction phase

# ESPRESSO PREINFUSION
# ❷ EVEN CONTACT TIME & TEMPERATURE (2/7)

- The volume of a 20g coffee dose (dry grinds), tamped in a 58 mm basket, is more or less 30 $cm^3$
- Around 20 mL of water suffice to saturate this amount of grinds
- Let's consider a typical 1:2 brew ratio to get 40 mL of coffee in the cup



# ESPRESSO PREINFUSION
# ❷ EVEN CONTACT TIME & TEMPERATURE (3/7)

- In this example with the chosen brew ratio of 1:2, "Extraction" water only pushes down the preinfusion water through the puck; it is not actually used as brewing water (also valid for lower brew ratios)

- Considering a constant flow extraction phase and our 20 g coffee dose, the contact time of the coffee grinds with water are:
  - top of the coffee puck → preinfusion time + extraction time – time to pour the last 20 mL *
  - bottom of the coffee puck → pouring time (once preinfusion is complete)

- In this example (DE1 v1.1 & 20 g of coffee in a 18 g basket), with a constant flow rate during extraction, preinfusion should be roughly twice shorter than the extraction phase to get an even overall contact time for all coffee grinds

* Probably slightly less if puck erosion was considered (not taken into account here)

# ESPRESSO PREINFUSION
# ❷ EVEN CONTACT TIME & TEMPERATURE (4/7)

Best suggested settings to reach **even Puck Contact Time** *

| Extraction flow rate (mL/s) | | | Brew ratio (20 g coffee dose) | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1 : 1 (20 g in, 20 g out) | | | | | 1 : 1,5 (20 g in, 30 g out) | | | | | 1 : 2 (20 g in, 40 g out) | | | | | 1 : 2,5 (20 g in, 50 g out) | | | | | 1 : 3 (20 g in, 60 g out) | | | | |
| | | | Preinfusion flow rate (mL/s) and time | | | | | Preinfusion flow rate (mL/s) and time | | | | | Preinfusion flow rate (mL/s) and time | | | | | Preinfusion flow rate (mL/s) and time | | | | | Preinfusion flow rate (mL/s) and time | | | | |
| | | | 1 | 2 | 4 | 6 | 8 | 1 | 2 | 4 | 6 | 8 | 1 | 2 | 4 | 6 | 8 | 1 | 2 | 4 | 6 | 8 | 1 | 2 | 4 | 6 | 8 |
| | | | 40 s | 20 s | 10 s | 7 s | 5 s | 40 s | 20 s | 10 s | 7 s | 5 s | 40 s | 20 s | 10 s | 7 s | 5 s | 40 s | 20 s | 10 s | 7 s | 5 s | 40 s | 20 s | 10 s | 7 s | 5 s |
| | 0,5 | **Total shot time** | **80** | **60** | **50** | **47** | 45 | **100** | **80** | **70** | **67** | **65** | **120** | **100** | **90** | **87** | **85** | **140** | **120** | **110** | **107** | **105** | **160** | **140** | **130** | **127** | **125** |
| | | Top puck contact time | 40 | 20 | 10 | 7 | 5 | 60 | 40 | 30 | 27 | 25 | 80 | 60 | 50 | 47 | 45 | 100 | 80 | 70 | 67 | 65 | 120 | 100 | 90 | 87 | 85 |
| | | Bottom puck contact time | 40 | 40 | 40 | 40 | 40 | 60 | 60 | 60 | 60 | 60 | 80 | 80 | 80 | 80 | 80 | 100 | 100 | 100 | 100 | 100 | 120 | 120 | 120 | 120 | 120 |
| | 1 | **Total shot time** | **60** | 40 | 30 | 27 | 25 | **70** | **50** | 40 | 37 | 35 | **80** | **60** | **50** | **47** | 45 | **90** | **70** | **60** | **57** | **55** | **100** | **80** | **70** | **67** | **65** |
| | | Top puck contact time | 40 | 20 | 10 | 7 | 5 | 50 | 30 | 20 | 17 | 15 | 60 | 40 | 30 | 27 | 25 | 70 | 50 | 40 | 37 | 35 | 80 | 60 | 50 | 47 | 45 |
| | | Bottom puck contact time | 20 | 20 | 20 | 20 | 20 | 30 | 30 | 30 | 30 | 30 | 40 | 40 | 40 | 40 | 40 | 50 | 50 | 50 | 50 | 50 | 60 | 60 | 60 | 60 | 60 |
| | 1,5 | **Total shot time** | **53** | 33 | **23** | **20** | **18** | **60** | 40 | 30 | 27 | 25 | **67** | **47** | 37 | 33 | 32 | **73** | **53** | 43 | 40 | 38 | **80** | **60** | **50** | **47** | 45 |
| | | Top puck contact time | 40 | 20 | 10 | 7 | 5 | 47 | 27 | 17 | 13 | 12 | 53 | 33 | 23 | 20 | 18 | 60 | 40 | 30 | 27 | 25 | 67 | 47 | 37 | 33 | 32 |
| | | Bottom puck contact time | 13 | 13 | 13 | 13 | 13 | 20 | 20 | 20 | 20 | 20 | 27 | 27 | 27 | 27 | 27 | 33 | 33 | 33 | 33 | 33 | 40 | 40 | 40 | 40 | 40 |
| | 2 | **Total shot time** | **50** | 30 | **20** | **17** | **15** | **55** | 35 | 25 | 22 | **20** | **60** | 40 | 30 | 27 | 25 | **65** | 45 | 35 | 32 | 30 | **70** | **50** | 40 | 37 | 35 |
| | | Top puck contact time | 40 | 20 | 10 | 7 | 5 | 45 | 25 | 15 | 12 | 10 | 50 | 30 | 20 | 17 | 15 | 55 | 35 | 25 | 22 | 20 | 60 | 40 | 30 | 27 | 25 |
| | | Bottom puck contact time | 10 | 10 | 10 | 10 | 10 | 15 | 15 | 15 | 15 | 15 | 20 | 20 | 20 | 20 | 20 | 25 | 25 | 25 | 25 | 25 | 30 | 30 | 30 | 30 | 30 |
| | 2,5 | **Total shot time** | **48** | 28 | **18** | **15** | **13** | **52** | 32 | **22** | **19** | **17** | **56** | 36 | 26 | **23** | **21** | **60** | 40 | 30 | 27 | 25 | **64** | 44 | 34 | 31 | 29 |
| | | Top puck contact time | 40 | 20 | 10 | 7 | 5 | 44 | 24 | 14 | 11 | 9 | 48 | 28 | 18 | 15 | 13 | 52 | 32 | 22 | 19 | 17 | 56 | 36 | 26 | 23 | 21 |
| | | Bottom puck contact time | 8 | 8 | 8 | 8 | 8 | 12 | 12 | 12 | 12 | 12 | 16 | 16 | 16 | 16 | 16 | 20 | 20 | 20 | 20 | 20 | 24 | 24 | 24 | 24 | 24 |
| | 3 | **Total shot time** | **47** | 27 | **17** | **13** | **12** | **50** | 30 | **20** | **17** | **15** | **53** | 33 | **23** | **20** | **18** | **57** | 37 | 27 | **23** | **22** | **60** | 40 | 30 | 27 | 25 |
| | | Top puck contact time | 40 | 20 | 10 | 7 | 5 | 43 | 23 | 13 | 10 | 8 | 47 | 27 | 17 | 13 | 12 | 50 | 30 | 20 | 17 | 15 | 53 | 33 | 23 | 20 | 18 |
| | | Bottom puck contact time | 7 | 7 | 7 | 7 | 7 | 10 | 10 | 10 | 10 | 10 | 13 | 13 | 13 | 13 | 13 | 17 | 17 | 17 | 17 | 17 | 20 | 20 | 20 | 20 | 20 |



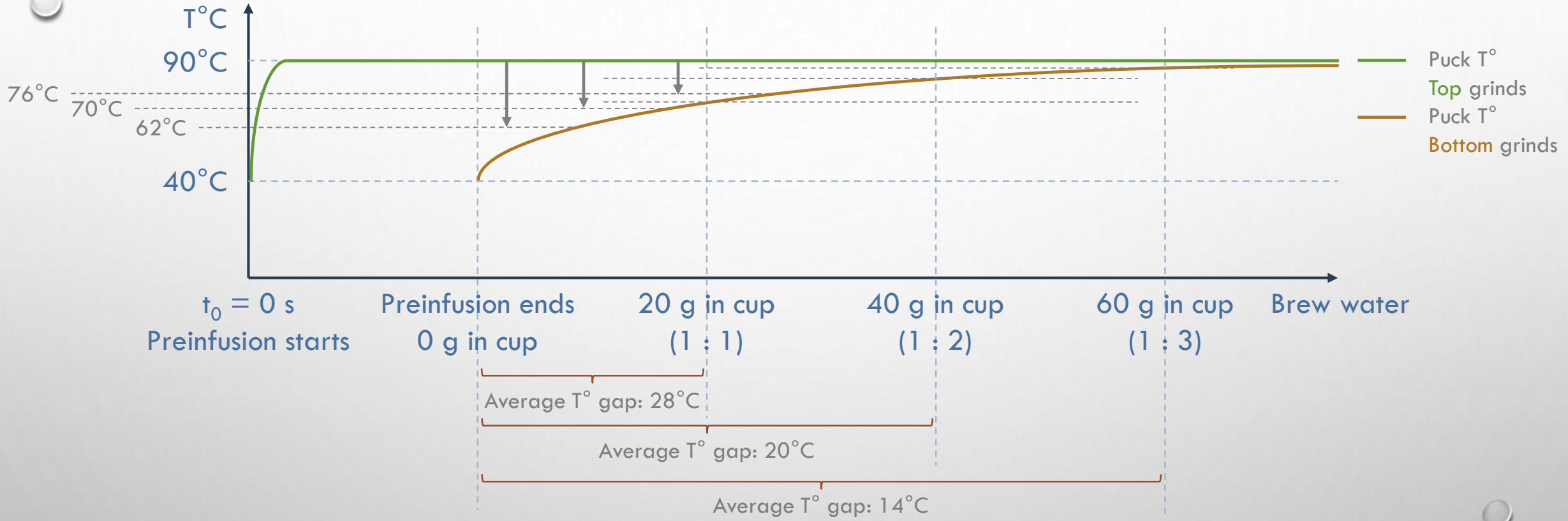
* DE1 PRO v1.1 machine – 20 g in a 18 g basket

# ESPRESSO PREINFUSION
# ❷ EVEN CONTACT TIME & TEMPERATURE (5/7)

- On top of contact time differences along the height of the puck, the **brew temperature varies significantly within the coffee puck**. Identified influencing parameters are:
  - Higher brew ratios are positive as they smoothen the phenomenon
  - Longer preinfusion and extraction increase the thermal losses and decrease the actual brewing temperature (hence have detrimental effect on temperature evenness)

- Also, as coffee gets extracted, the resulting fluid gets more concentrated in extracted compounds which makes it less efficient than pure water to perform further extraction. The consequence, again, is a lower extraction of the coffee grinds from the bottom of the puck.
  - As for temperature unevenness, this effect becomes less visible when the brew ratio increases
  - Unclear impact (if any) of preinfusion and extraction flow rates on this phenomenon

# ESPRESSO PREINFUSION
# ❷ EVEN CONTACT TIME & TEMPERATURE (6/7)




- Increasing the brew ratio from 1:1 to 1:3 halves the temperature gap between top and bottom grinds
- However, as extraction efficiency decreases with time, the actual benefits in the cup are presumably lower than those suggested by these average gap values

# ESPRESSO PREINFUSION
# ❷ EVEN CONTACT TIME & TEMPERATURE (7/7)

Best suggested settings to reach **even Puck Contact Time and temperature** *

| Extraction flow rate (mL/s) | | Brew ratio (20 g coffee dose) | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 : 1 (20 g in, 20 g out) | | | | | 1 : 1,5 (20 g in, 30 g out) | | | | | 1 : 2 (20 g in, 40 g out) | | | | | 1 : 2,5 (20 g in, 50 g out) | | | | | 1 : 3 (20 g in, 60 g out) | | | | |
| | | Preinfusion flow rate (mL/s) and time | | | | | Preinfusion flow rate (mL/s) and time | | | | | Preinfusion flow rate (mL/s) and time | | | | | Preinfusion flow rate (mL/s) and time | | | | | Preinfusion flow rate (mL/s) and time | | | | |
| | | 1 | 2 | 4 | 6 | 8 | 1 | 2 | 4 | 6 | 8 | 1 | 2 | 4 | 6 | 8 | 1 | 2 | 4 | 6 | 8 | 1 | 2 | 4 | 6 | 8 |
| | | 40 s | 20 s | 10 s | 7 s | 5 s | 40 s | 20 s | 10 s | 7 s | 5 s | 40 s | 20 s | 10 s | 7 s | 5 s | 40 s | 20 s | 10 s | 7 s | 5 s | 40 s | 20 s | 10 s | 7 s | 5 s |
| 0,5 | **Total shot time** | **80** | **60** | **50** | **47** | 45 | **100** | **80** | **70** | **67** | **65** | **120** | **100** | **90** | **87** | **85** | **140** | **120** | **110** | **107** | **105** | **160** | **140** | **130** | **127** | **125** |
| | Top puck contact time | 40 | 20 | 10 | 7 | 5 | 60 | 40 | 30 | 27 | 25 | 80 | 60 | 50 | 47 | 45 | 100 | 80 | 70 | 67 | 65 | 120 | 100 | 90 | 87 | 85 |
| | Bottom puck contact time | 40 | 40 | 40 | 40 | 40 | 60 | 60 | 60 | 60 | 60 | 80 | 80 | 80 | 80 | 80 | 100 | 100 | 100 | 100 | 100 | 120 | 120 | 120 | 120 | 120 |
| 1 | **Total shot time** | **60** | 40 | 30 | 27 | 25 | **70** | **50** | 40 | 37 | 35 | **80** | **60** | **50** | **47** | 45 | **90** | **70** | **60** | **57** | **55** | **100** | **80** | **70** | **67** | **65** |
| | Top puck contact time | 40 | 20 | 10 | 7 | 5 | 50 | 30 | 20 | 17 | 15 | 60 | 40 | 30 | 27 | 25 | 70 | 50 | 40 | 37 | 35 | 80 | 60 | 50 | 47 | 45 |
| | Bottom puck contact time | 20 | 20 | 20 | 20 | 20 | 30 | 30 | 30 | 30 | 30 | 40 | 40 | 40 | 40 | 40 | 50 | 50 | 50 | 50 | 50 | 60 | 60 | 60 | 60 | 60 |
| 1,5 | **Total shot time** | **53** | 33 | **23** | **20** | **18** | **60** | 40 | 30 | 27 | 25 | **67** | **47** | 37 | 33 | 32 | **73** | **53** | 43 | 40 | 38 | **80** | **60** | **50** | **47** | 45 |
| | Top puck contact time | 40 | 20 | 10 | 7 | 5 | 47 | 27 | 17 | 13 | 12 | 53 | 33 | 23 | 20 | 18 | 60 | 40 | 30 | 27 | 25 | 67 | 47 | 37 | 33 | 32 |
| | Bottom puck contact time | 13 | 13 | 13 | 13 | 13 | 20 | 20 | 20 | 20 | 20 | 27 | 27 | 27 | 27 | 27 | 33 | 33 | 33 | 33 | 33 | 40 | 40 | 40 | 40 | 40 |
| 2 | **Total shot time** | **50** | 30 | **20** | **17** | **15** | **55** | 35 | 25 | 22 | **20** | **60** | 40 | 30 | 27 | 25 | **65** | 45 | 35 | 32 | 30 | **70** | **50** | 40 | 37 | 35 |
| | Top puck contact time | 40 | 20 | 10 | 7 | 5 | 45 | 25 | 15 | 12 | 10 | 50 | 30 | 20 | 17 | 15 | 55 | 35 | 25 | 22 | 20 | 60 | 40 | 30 | 27 | 25 |
| | Bottom puck contact time | 10 | 10 | 10 | 10 | 10 | 15 | 15 | 15 | 15 | 15 | 20 | 20 | 20 | 20 | 20 | 25 | 25 | 25 | 25 | 25 | 30 | 30 | 30 | 30 | 30 |
| 2,5 | **Total shot time** | **48** | 28 | **18** | **15** | **13** | **52** | 32 | **22** | **19** | **17** | **56** | 36 | 26 | **23** | **21** | **60** | 40 | 30 | 27 | 25 | **64** | 44 | 34 | 31 | 29 |
| | Top puck contact time | 40 | 20 | 10 | 7 | 5 | 44 | 24 | 14 | 11 | 9 | 48 | 28 | 18 | 15 | 13 | 52 | 32 | 22 | 19 | 17 | 56 | 36 | 26 | 23 | 21 |
| | Bottom puck contact time | 8 | 8 | 8 | 8 | 8 | 12 | 12 | 12 | 12 | 12 | 16 | 16 | 16 | 16 | 16 | 20 | 20 | 20 | 20 | 20 | 24 | 24 | 24 | 24 | 24 |
| 3 | **Total shot time** | **47** | 27 | **17** | **13** | **12** | **50** | 30 | **20** | **17** | **15** | **53** | 33 | **23** | **20** | **18** | **57** | 37 | 27 | **23** | **22** | **60** | 40 | 30 | 27 | 25 |
| | Top puck contact time | 40 | 20 | 10 | 7 | 5 | 43 | 23 | 13 | 10 | 8 | 47 | 27 | 17 | 13 | 12 | 50 | 30 | 20 | 17 | 15 | 53 | 33 | 23 | 20 | 18 |
| | Bottom puck contact time | 7 | 7 | 7 | 7 | 7 | 10 | 10 | 10 | 10 | 10 | 13 | 13 | 13 | 13 | 13 | 17 | 17 | 17 | 17 | 17 | 20 | 20 | 20 | 20 | 20 |

* DE1 PRO v1.1 machine – 20 g in a 18 g basket

# ESPRESSO PREINFUSION
# ❸ EVEN PUCK SURFACE AFTER PREINFUSION

- Once extraction is complete, craters can sometimes be observed on the surface of the coffee puck
- The exact root cause of these craters is not fully clear but trying to avoid them seems a reasonable objective, as they reveal that channeling has probably occurred during extraction

- As far as the generation of craters is concerned, the **very beginning of the preinfusion phase** is probably one of the most critical moments: it can be assumed that water droplets hitting repeatedly the same spot of the top of the puck could create this kind of surface unevenness
- To mitigate the risk of generating craters at the beginning of the preinfusion, one can recommend to **avoid too high or too low preinfusion flow rates:**
    - With high flow rates (> 5 mL/s) water will obviously hit the surface with more energy
    - With very low flow rates (< 1 mL/s), water distribution above the puck may be suboptimal

- A **moderate speed of pressure increase after PI** has also proven to reduce the occurrence of craters

- Other actions not linked with the preinfusion flow rate (e.g. puck preparation, headspace, shower screen cleanliness & type) to avoid puck craters & channeling in general, have note been analyzed

# ESPRESSO PREINFUSION
# HOW TO MAKE IT MORE DECENT (1/2)

- **With the Decent Espresso machine, the preinfusion process can easily be modified to benefit from the best of each flow rate family and improve the overall preinfusion performance**

| | Constant preinfusion flow rates | | | | Variable preinfusion flow rate |
|---|---|---|---|---|---|
| | Very low flow (0.5 – 1.5 mL/s) | Low medium (1.5 – 3.0 mL/s) | Medium high (3.0 – 5.0 mL/s) | High flow (5.0 – 8.0 mL/s) | |
| 1 Even puck compression | ++ | + | – | – – | + |
| 2 Even Puck Contact Time & Temp. | – – | – (+ with low extraction flows) | + | – (+ with high extraction flows) | + |
| 3 Even puck surface | – | + | + | – | + |

# ESPRESSO PREINFUSION
# HOW TO MAKE IT MORE DECENT (2/2)

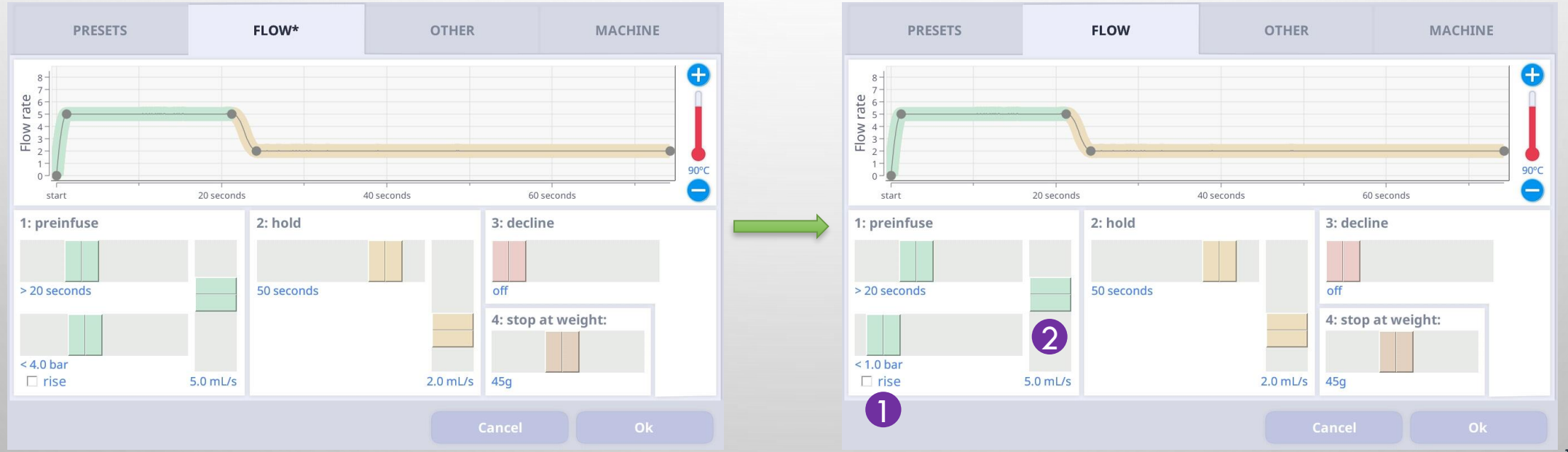
- **With the Decent Espresso machine, on top of the possibility to select any flow rate value to perform preinfusion, a 2 step approach can further improve the consistency of the process: medium high flow rate first, followed by a lower flow rate phase**
    - A moderate high flow rate at the very beginning of the preinfusion reduces the overall preinfusion time and hence improves the Puck Contact Time homogeneity (avoids too high PCT ratio)
    - Low flow rate in the second preinfusion step limits puck compression and a too steep pressure increase once preinfusion is complete
    - The switch between the 2 preinfusion steps can easily be triggered by a pressure threshold (typically around 1 bar)

- If the most even preinfusion is the target (and hence the most even overall extraction) it is also possible to adjust all preinfusion and extraction parameters (flow rates, thresholds) taking into account the proposed chart (page 14)

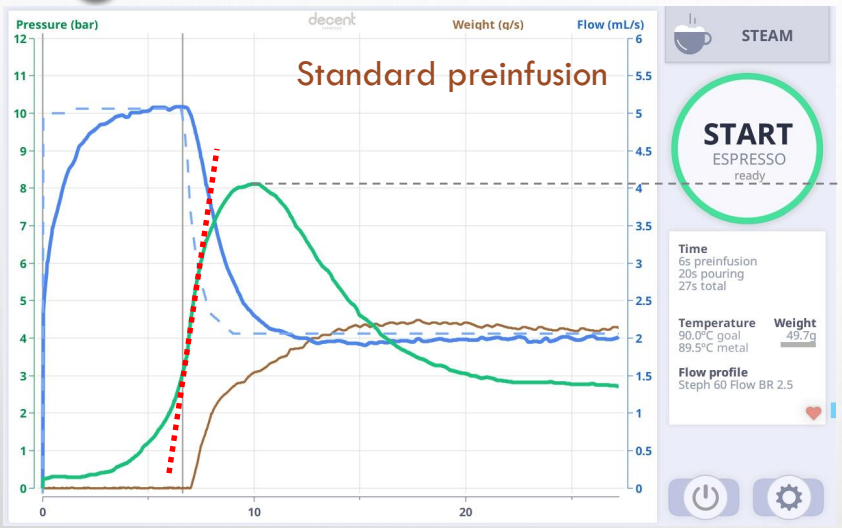
- Impacts of other parameters (e.g. dose, puck preparation, headspace) will be quantified and discussed in a future study

# ESPRESSO PREINFUSION
# ADVANCED DECENT PREINFUSION (1/3)

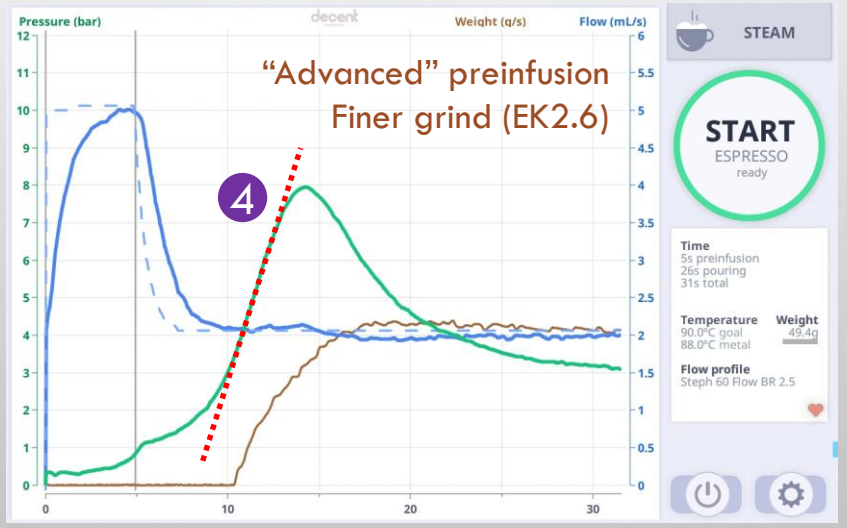
- **Advanced preinfusion with a standard Flow profile (1/2)**
  1. Anticipated switch to the "extraction" phase with lower flow rate (exit pressure: 4 bar → 1 bar)
  2. A higher initial preinfusion flow rate can be selected to compensate for longer actual preinfusion and avoid too high PCT ratio



# ESPRESSO PREINFUSION
# ADVANCED DECENT PREINFUSION (2/3)

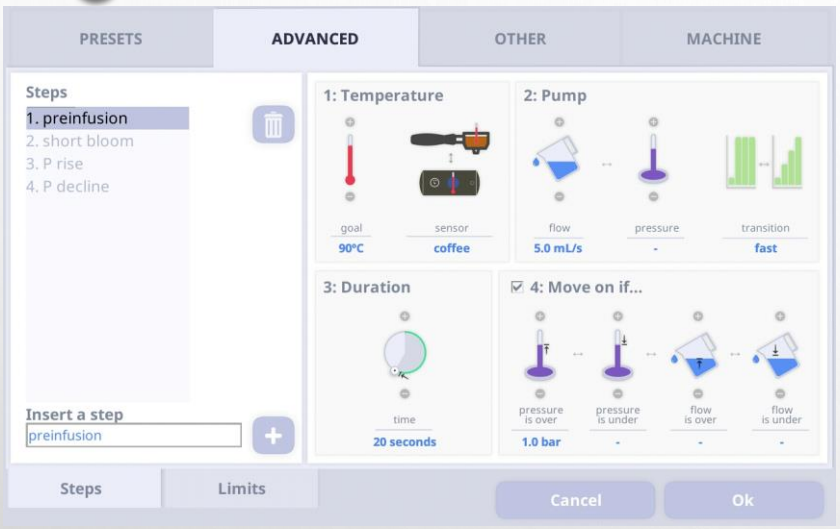


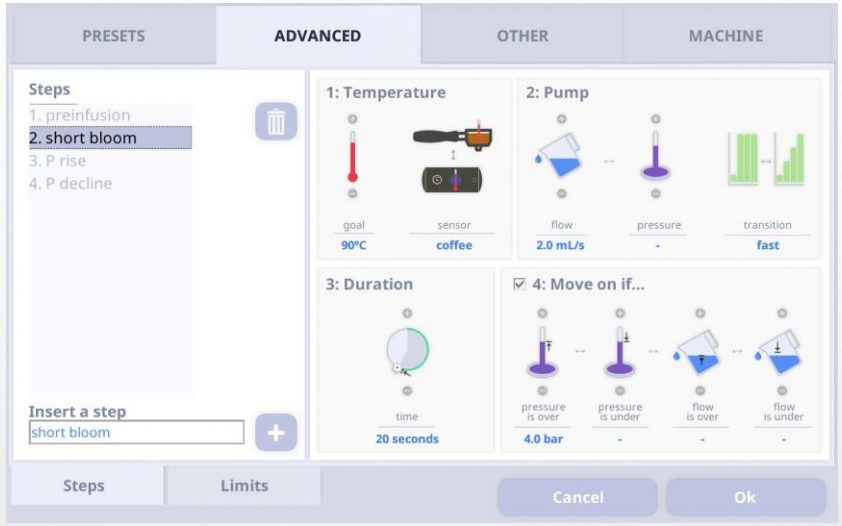


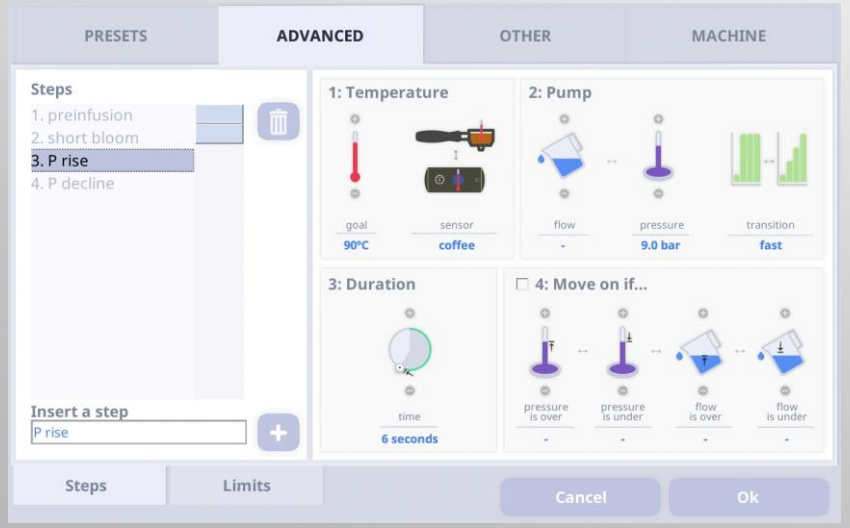



- **<u>Standard Flow profile (2/2)</u>**
  - 3 Finer grind is required to maintain maximum extraction pressure (less puck compression, lower average flow rate before the pressure peak)
  - 4 The smoother pressure rise (1.5 bar vs 3.7 bar / second) is also beneficial to lower the risk of channeling during extraction

# ESPRESSO PREINFUSION
# ADVANCED DECENT PREINFUSION (3/3)



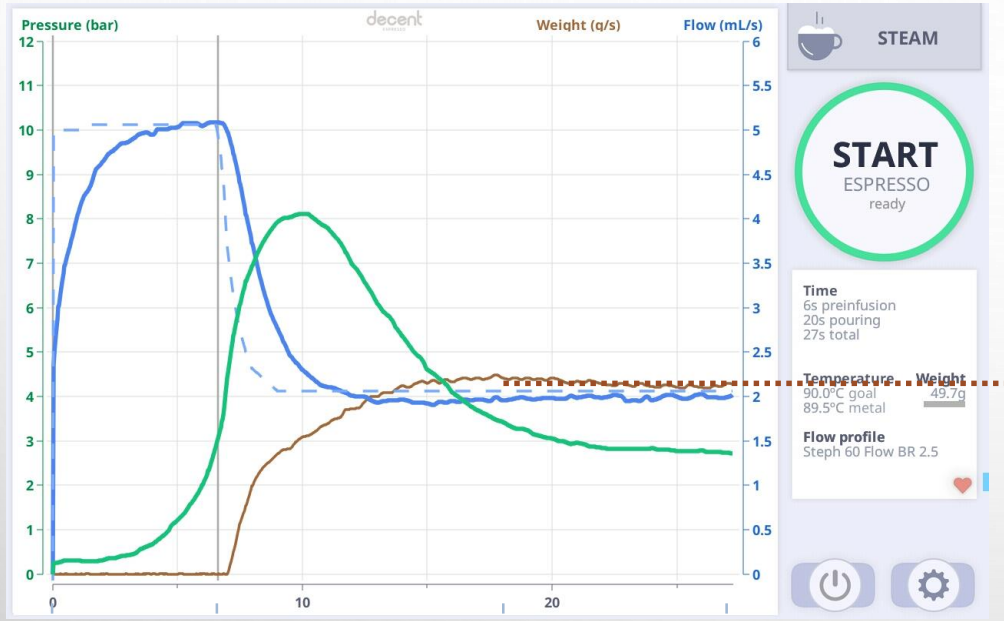





- **<u>For a Pressure priority shot an advanced profile is needed</u>**
  - Exit pressures of steps 1 and 2 can be adjusted to reach optimum preinfusion time
  - An additional step between stages 2 and 3 could be imagined (e.g. pressure ramp to ensure smoother transition)
  - Trials to replace step 2 by a pressure priority phase (e.g. 1 bar) have not been very successful (hard to get smooth transitions between flow and pressure priority modes)

# ESPRESSO PREINFUSION
# HOW GOOD IS YOUR PUCK CONTACT TIME RATIO?




**E**xcess **C**ontact **T**ime of **T**op grinds
**ECTT** = preinfusion time
(6 s in this example)

**E**xcess **C**ontact **T**ime of **B**ottom grinds
**ECTB** = time to pour the
"residual brew water"

Actual average final extraction flow rate in cup = **2.2mL/s**

18 g dose → 18 mL residual brew water

**ECTB = 18 / 2.2 = 8.2 s**

**PCT ratio = 6 / 8.2 = 0.7**

- **PCT ratio = ECTT / ECTB**
- **ECTT = preinfusion time**
- **ECTB = time to pour the "residual brew water"**
- Residual brew water volume = more or less 1 mL / g of dry coffee (dose) *
- **Target for PCT ratio = 1**
- **PCT ratio < 1: too short preinfusion**

* Probably slightly less if puck erosion was considered (not taken into account here)