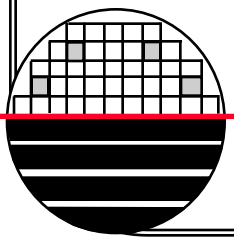
ROCHESTER INSTITUTE OF TECHNOLOGY
MICROELECTRONIC ENGINEERING

# Bruce Furnace Recipes

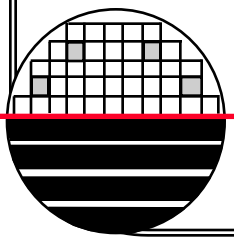

## Dr. Lynn Fuller

**Webpage: http://people.rit.edu/lffeee**
**Electrical and Microelectronic Engineering**
**Rochester Institute of Technology**
**82 Lomb Memorial Drive**
**Rochester, NY 14623-5604**
**Tel (585) 475-2035**
**Fax (585) 475-5041**
**Email: Lynn.Fuller@rit.edu**
**Department Webpage: http://www.microe.rit.edu**

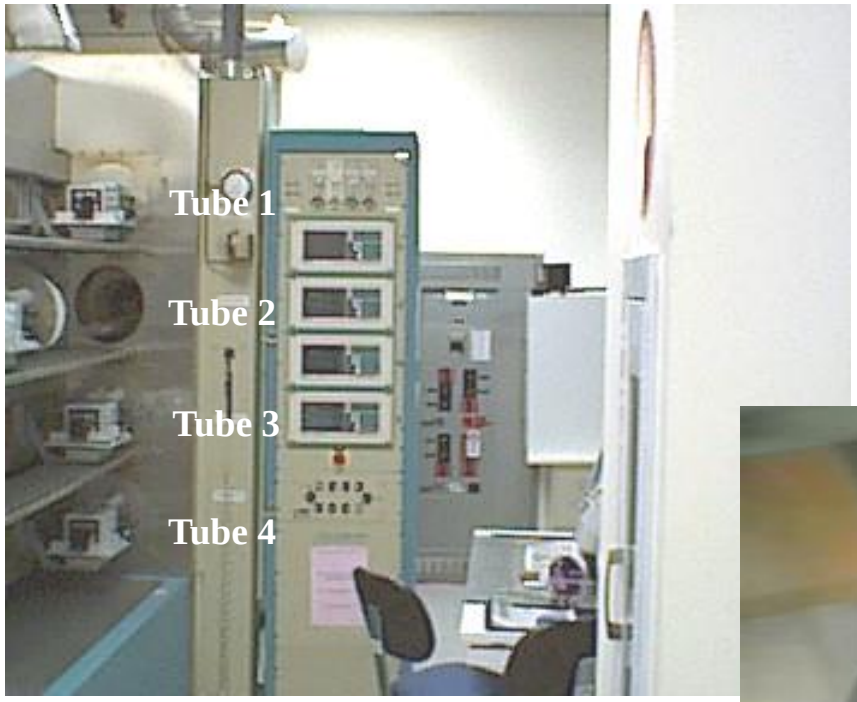



# *OUTLINE*

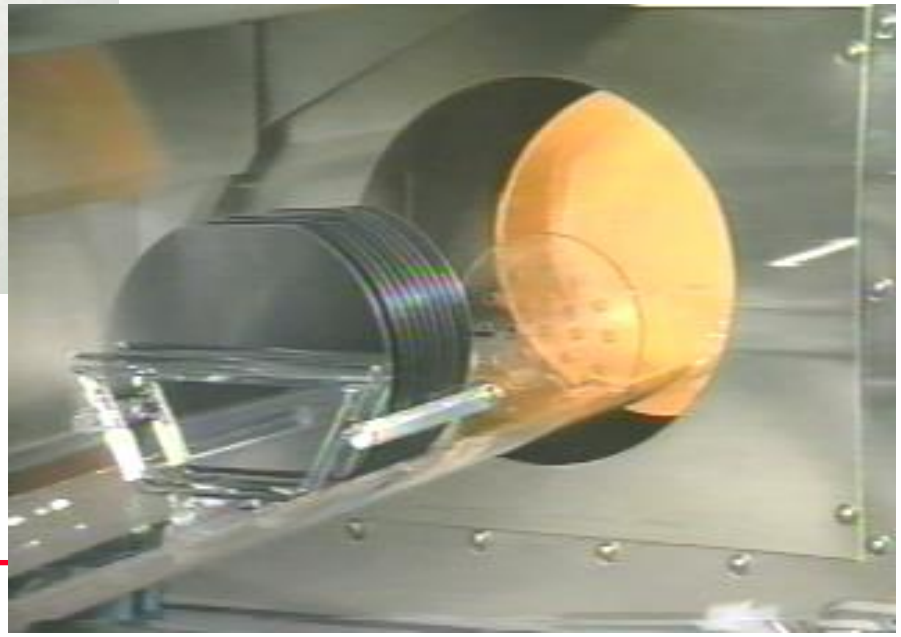




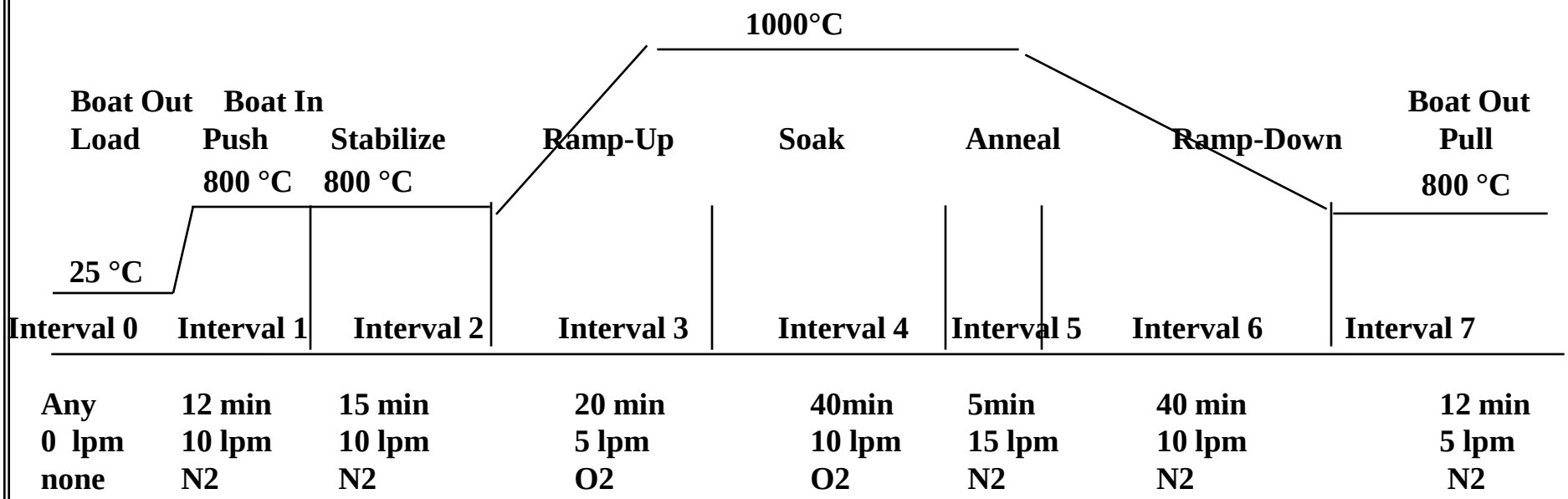
# BRUCE FURNACE




Tube 1 Steam Oxides
Tube 2 P-type Diffusion
Tube 3 N-type Diffusion
Tube 4 Dry Oxides and Gate Oxides

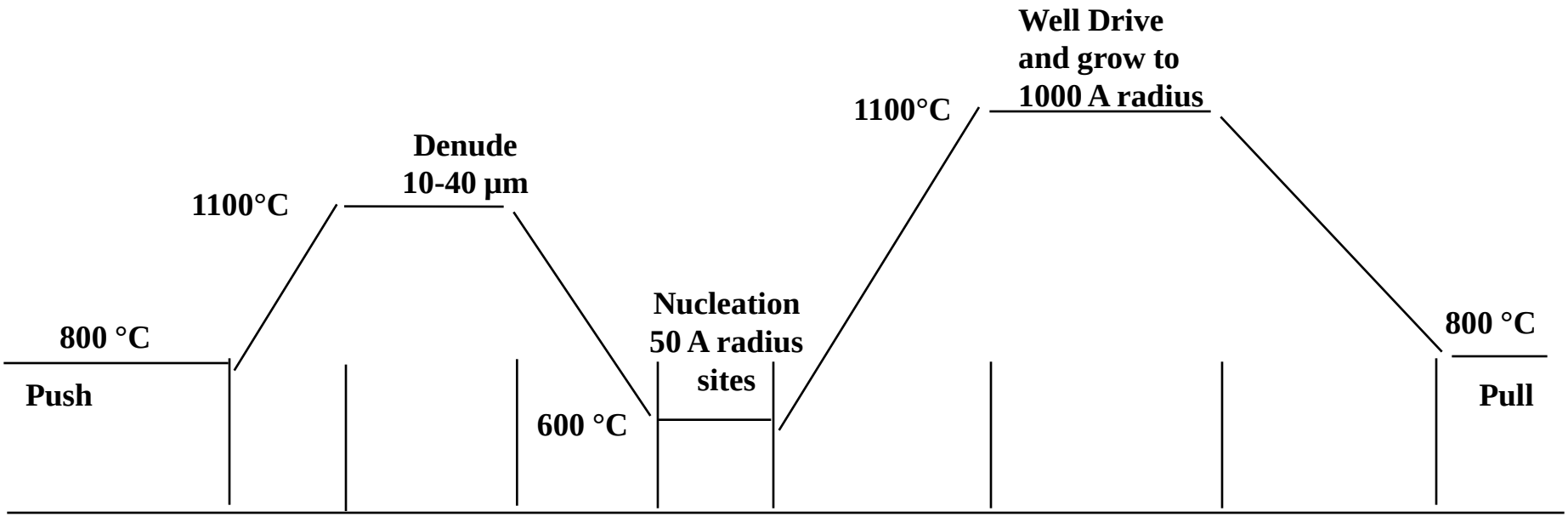


# BRUCE FURNACE RECIPES



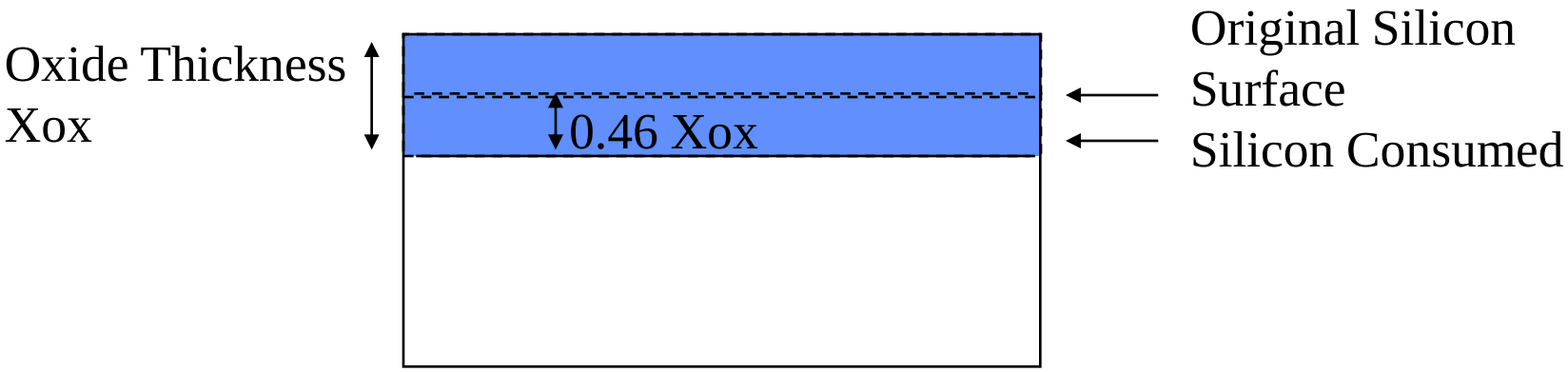

At the end of a run the furnace returns to Interval 0 which is set for boat out, 25 °C and no gas flow. The furnace waits in that state until someone aborts the current recipe or loads a new recipe.

# ADVANCED FURNACE RECIPES




**15-20 ppma Oxygen Starting Wafers**

# OXIDE GROWTH




Dry oxide O2 only
Wet oxide O2 bubbled through water
Steam burn H2 in O2 to make H20 (steam)

# USING EXCEL SPREADSHEET FOR OXIDE GROWTH CALCULATIONS

ROCHESTER INSTITUTE OF TECHNOLOGY — OXIDE.XLS
MICROELECTRONIC ENGINEERING — 7/4/2014

CALCULATION OF OXIDE THICKNESS — Dr. Lynn Fuller / Jamie Wasiewicz

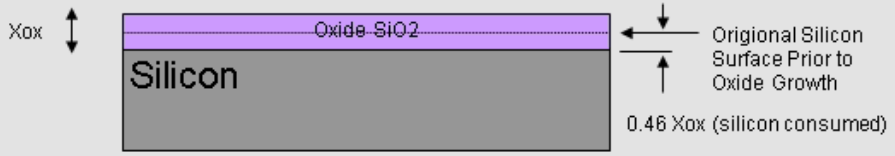
To use this spreadsheed change the values in the white boxes. The rest of the sheet is protected and should not be changed unless you are sure of the consequences. The calculated results are shown in the purple boxes. O2 bubbled through warm water is "wet", burning H2 with O2 is called "steam"

| CONSTANTS | | | VARIABLES | | | CHOICES | |
|---|---|---|---|---|---|---|---|
| K | 1.38E-23 | J/K | | | | 1=yes, 0=no | |
| (Bo/Ao) dry | 6230000 | µm/hr | Temp = | 900 | °C | wet | 0 |
| Ea (dry) | 2 | eV | time = | 42 | min | dry | 0 |
| (Bo/Ao) wet | 89500000 | µm/hr | Partial Pressure, p = | 1.00 | Atm | steam | 1 |
| Ea (wet) | 2.05 | eV | | | | <100> | 1 |
| (Bo/Ao) stean | 1.63E+08 | µm/hr | | | | <111> | 0 |
| Ea (steam) | 2.05 | eV | | | | | |
| Bo dry | 7.72E+02 | µm2/hr | Xint= | 0 | Å | | |
| Ea (dry) | 1.23 | eV | | | | | |
| Bo wet | 2.14E+02 | µm2/hr | Silicon VLSI Technology, Plummer, Deal, Griffin | | | | |
| Ea (wet) | 0.71 | eV | Prentice Hall, 2000, pg 319-369 | | | | |
| Bo steam | 3.86E+02 | µm2/hr | | | | | |
| Ea (steam) | 0.78 | eV | (Bo/Ao)/1.68 for <100> | | | | |

CALCULATIONS:

Xox (Oxide thickness)=(A/2){[1+(t+Tau)4B/A^2]^0.5 -1} = 1005 Å

| | | |
|---|---|---|
| B = [Bo exp (-Ea/KTemp)]*p | 0.1737431 | µm2/hr |
| B/A = [(Bo/Ao) exp (-Ea/KTemp)]*p | 1.57E-01 | µm/hr |
| A | 1.1100164 | µm |
| Tau = (Xi2+AXi)/B | 0 | hr |




These spreadsheets are available on Dr. Fullers webpage.

# USING EXCEL SPREADSHEET FOR D/S JUNCTION DEPTH & SHEET RHO CALCULATIONS

**CALCULATION OF ION IMPLANT JUNCTION DEPTH AND SHEET RESISTANCE AFTER DRIVE-IN**

| **CONSTANTS** | Boron | Phosorous | | **VALUE** | **UNITS** |
|---|---|---|---|---|---|
| | | | q = | 1.60E-19 | Coul |
| Max Mobility of n-type carriers | 470.5 | 1414 | | | |
| Min Mobility of p-type carriers | 44.9 | 68.5 | | | |
| Nref | 2.23E+17 | 9.20E+16 | | | |
| alpha | 0.719 | 0.711 | | | |

| **GIVEN** | | **VALUE** | **UNITS** | |
|---|---|---|---|---|
| Starting Wafer Resistivity | Rho = | 10 | ohm-cm | |
| Starting Wafer Type | n-type = | 0 | 1 or 0 | |
| | p-type = | 1 | 1 or 0 | |
| Pre Deposition Ion Implant Dose | | 9.50E+12 | ions/cm2 | |
| | | | | Implant Time for 6" wafers |
| Implant Beam Current | | 20 | µA | 0.24 min |
| Drive-in Temperature | T = | 1100 | °C | |
| Drive-in Time | t = | 750 | min | |

| **CALCULATE** | | **VALUE** | **UNITS** |
|---|---|---|---|
| Diffusion Constant at Temperature of Drive-in | D = | 1.33E-13 | cm2/sec |
| Diffusion Constant x time (use to adjust t for multiple Drive-ins) | Dt = | 5.99E-09 | cm2 |

**CALCULATION OF DIFFUSION CONSTANTS**

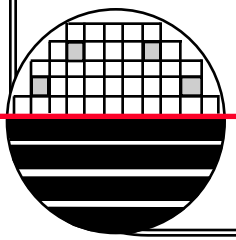
| | D0 (cm2/s) | EA (eV) |
|---|---|---|
| Boron | 0.76 | 3.46 |
| Phosphorous | 3.85 | 3.66 |

| **CALCULATIONS** | | **VALUE** | **UNITS** |
|---|---|---|---|
| Substrate Doping = 1 / (q µmax Rho) | Nsub = | 1.33E+15 | cm-3 |

| **RESULTS** | | **VALUE** | **UNITS** |
|---|---|---|---|
| Pre deposition Dose | Dose = | 9.50E+12 | atoms/cm2 |
| xj after drive-in = ((4 Dd td/QA) ln (Nsub (π Ddtd)^0.5))^0.5 | xj = | 3.08 | µm |
| average doping Nave = Dose/xj | Nave = | 3.09E+16 | atoms/cm3 |
| mobility (µ) at Doping equal to Nave | µ = | 990 | cm2/V-s |
| Sheet Resistance = 1/(q (µ(Nave))Dose) | Rhos = | 664.5 | ohms |
| Surface Concentration = Dose/ (pDt)^0.5 | Ns = | 6.93E+16 | cm-3 |

Diffusion Constants (cm2/sec) Solid Solubility (cm-3)

These spreadsheets are available on Dr. Fullers webpage.



# MINIMUM OXIDE NEEDED TO MASK DIFFUSION

or result will be in error.

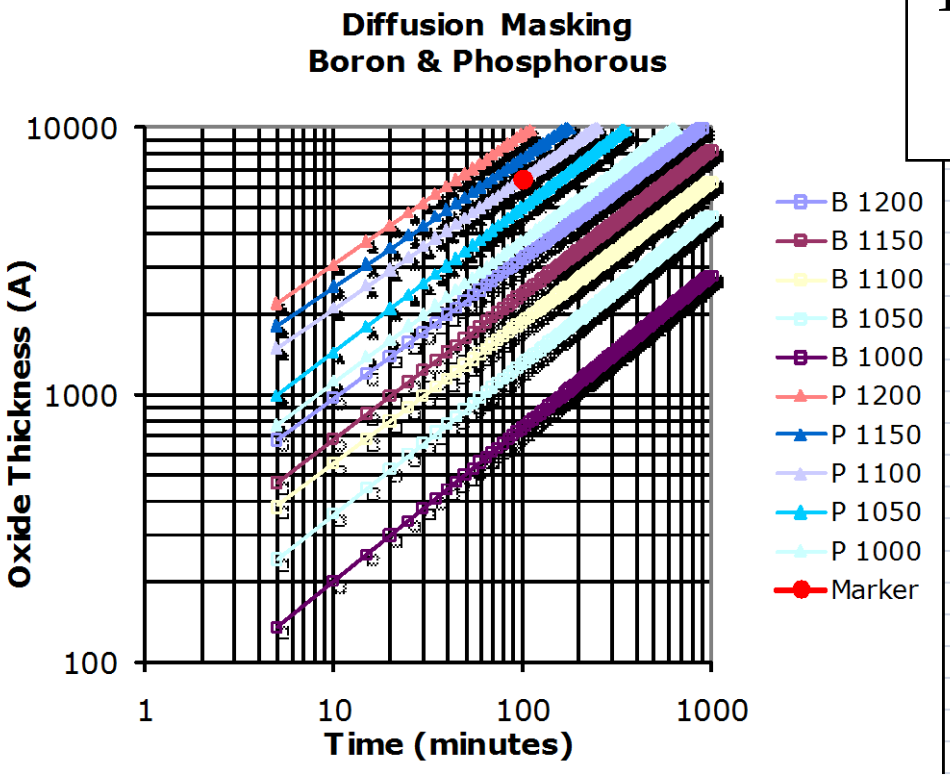
| Dopant | | Diffusion | | |
|---|---|---|---|---|
| Boron | 0 | Temp. | 1100 | °C |
| Phosphorous | 1 | Time | 100 | minutes |

| | |
|---|---|
| Boron | 1867 Angstroms |
| Phosp | 6399 Angstroms |

**Oxide**

**Fitted to data taken from Hamilton and Howard**

6399 Angstroms




These spreadsheets are available on Dr. Fullers webpge.

# OXIDE THICKNESS COLOR CHART

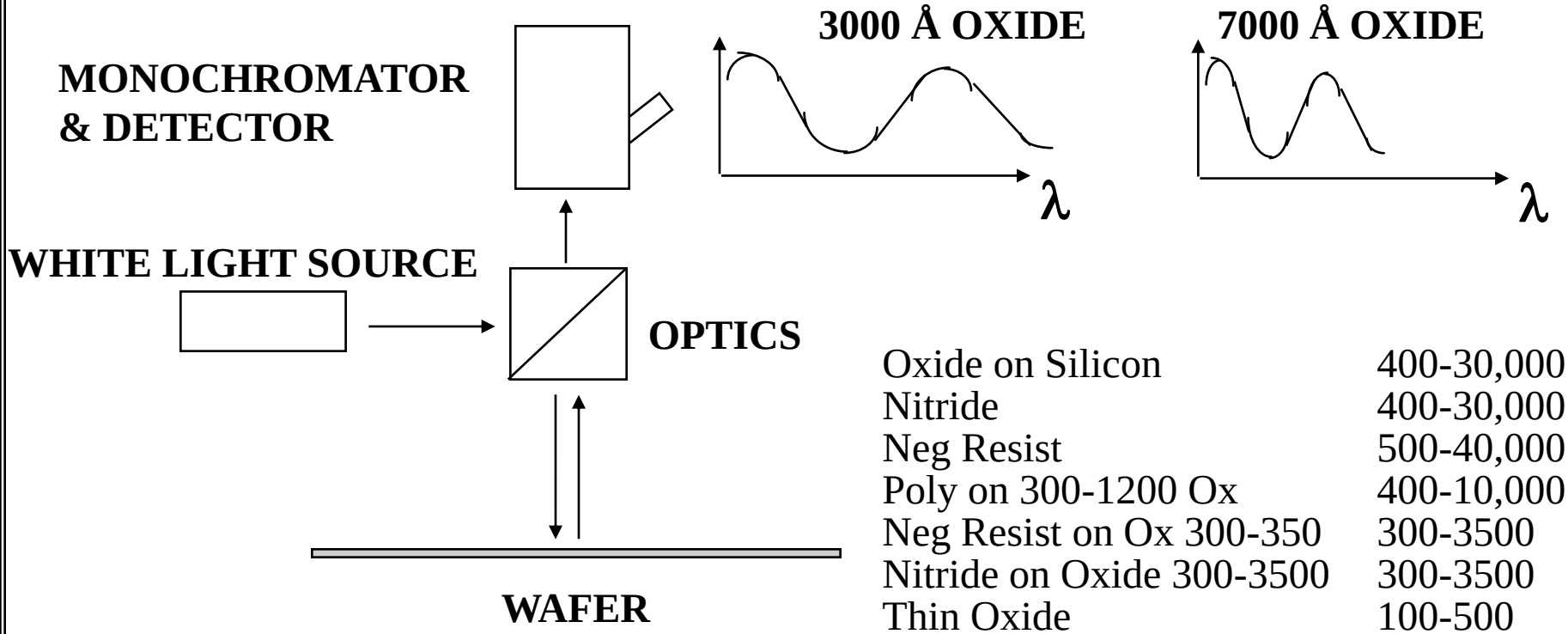
| Thickness | Color |
|---|---|
| 500 | Tan |
| 700 | Brown |
| 1000 | Dark Violet - Red Violet |
| 1200 | Royal Blue |
| 1500 | Light Blue - Metallic Blue |
| 1700 | Metallic - very light Yellow Green |
| 2000 | LIght Gold or Yellow - Slightly Metallic |
| 2200 | Gold with slight Yellow Orange |
| 2500 | Orange - Melon |
| 2700 | Red Violet |
| 3000 | Blue - Violet Blue |
| 3100 | Blue |
| 3200 | Blue - Blue Green |
| 3400 | Light Green |
| 3500 | Green - Yellow Green |
| 3600 | Yellow Green |
| 3700 | Yellow |
| 3900 | Light Orange |
| 4100 | Carnation Pink |
| 4200 | Violet Red |
| 4400 | Red Violet |
| 4600 | Violet |
| 4700 | Blue Violet |

| Thickness | Color |
|---|---|
| 4900 | Blue |
| 5000 | Blue Green |
| 5200 | Green |
| 5400 | Yellow Green |
| 5600 | GreenYellow |
| 5700 | Yellow -"Yellowish"(at times appears to be Lt gray or matel |
| 5800 | Light Orange or Yellow - Pink |
| 6000 | Carnation Pink |
| 6300 | Violet Red |
| 6800 | "Bluish"(appears violet red, Blue Green, looks |
| 7200 | Blue Green - Green |
| 7700 | "Yellowish" |
| 8000 | Orange |
| 8200 | Salmon |
| 8500 | Dull, LIght Red Violet |
| 8600 | Violet |
| 8700 | Blue Violet |
| 8900 | Blue |
| 9200 | Blue Green |
| 9500 | Dull Yellow Green |
| 9700 | Yellow - "Yellowish" |
| 9900 | Orange |
| 10000 | Carnation Pink |

Nitride Thickness = (Oxide Thickness)(Oxide Index/Nitride Index)
Eg. Yellow Nitride Thickness = (2000)(1.46/2.00) = 1460

# REFLECTANCE SPECTROMETER (NANOSPEC - THICKNESS MEASUREMENT)

**INCIDENT WHITE LIGHT, THE INTENSITY OF THE REFLECTED LIGHT IS MEASURED VS WAVELENGTH**

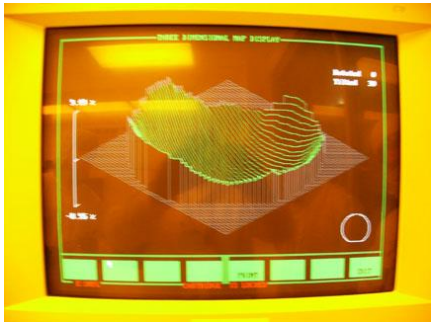


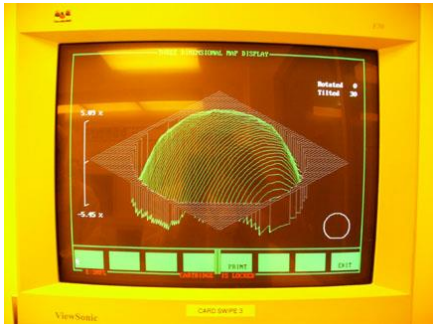

| | |
|---|---|
| Oxide on Silicon | 400-30,000 Å |
| Nitride | 400-30,000 |
| Neg Resist | 500-40,000 |
| Poly on 300-1200 Ox | 400-10,000 |
| Neg Resist on Ox 300-350 | 300-3500 |
| Nitride on Oxide 300-3500 | 300-3500 |
| Thin Oxide | 100-500 |
| Thin Nitride | 100-500 |
| Polyimide | 500-10,000 |
| Positive Resist | 500-40,000 |
| Pos Resist on Ox 500-15,000 | 4,000-30,000 |

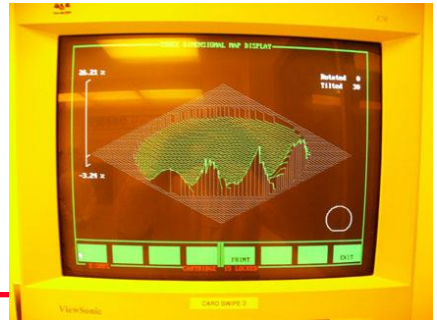
# NANOSPEC FILM THICKNESS MEASUREMENT TOOL

Record:
Color = Blue-Green
Color Chart Thickness = Å
Nanospec Thickness = Å

# TENCORE FT-300 SPECROMAP



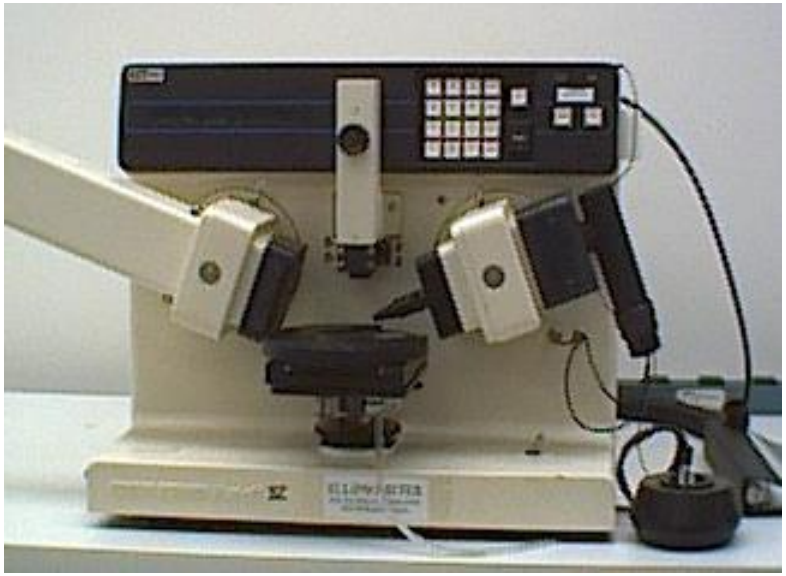


Record:

Mean
Std Deviation
Min
Max
No of Points

# *FT500*

# ELLIPSOMETER MEASUREMENTS



Measure wafers C1 and C2

Pattern 20 is 1 point in center of wafer
Pattern 22 is 5 points on 4” wafer
Pattern 25 is 5 points on 6” wafer

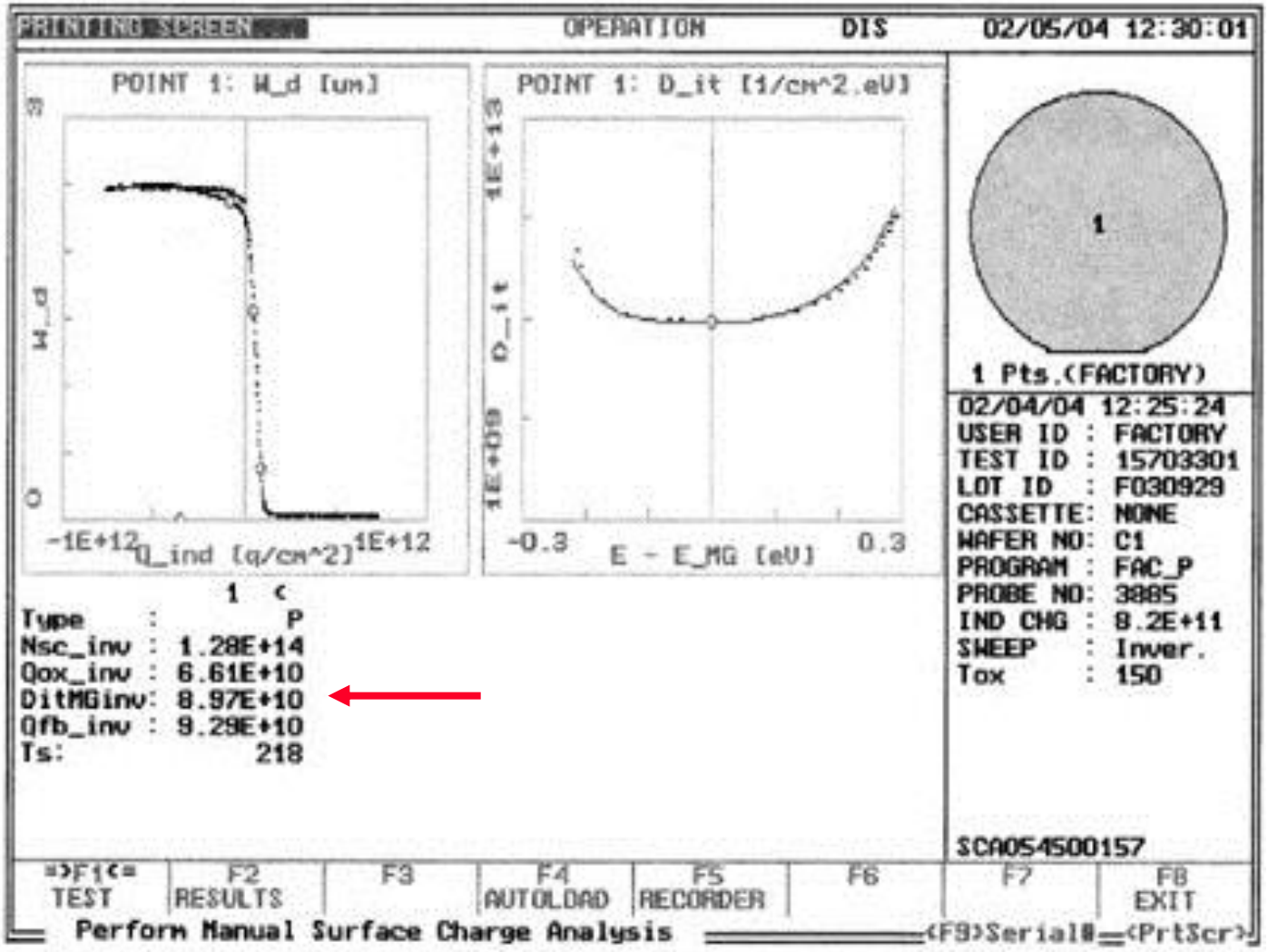
Recipe 03 is oxide on silicon
Recipe 07 is nitride on oxide on silicon
Recipe 02 is used for one film and finds thickness and index of refraction

# MEASURE C1 AND C2 ON SCA-2500

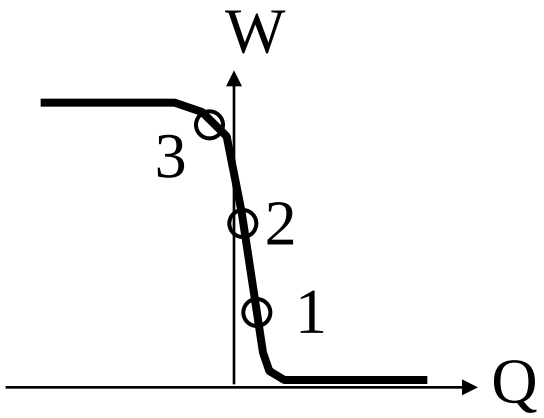
**Login: FACTORY**
**Password: OPER**
**<F1> Operate**
**<F1> Test Center the wafer on the stage**
**Select (use arrow keys on the numeric pad (far right on the keyboard)**
**space bar, page up, etc)**
**PROGRAM = FAC-P or FAC-N**
**LOT ID = F040909**
**WAFER NO. = D1**
**TOX = 463 (from nanospec)**
**<F12> start test and wait for measurement**
**<Print Screen> print results**
**<F8> exit and log off**
**<ESC> can be used anytime, but wait for current test to be completed**

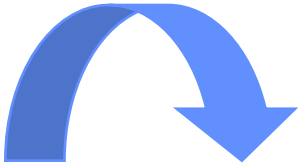
# SCA MEASUREMENT OF GATE OXIDE

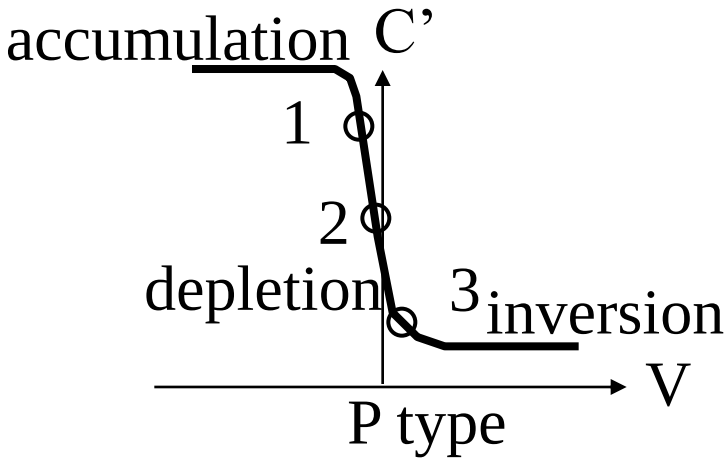
PLAY



# SCA THEORY



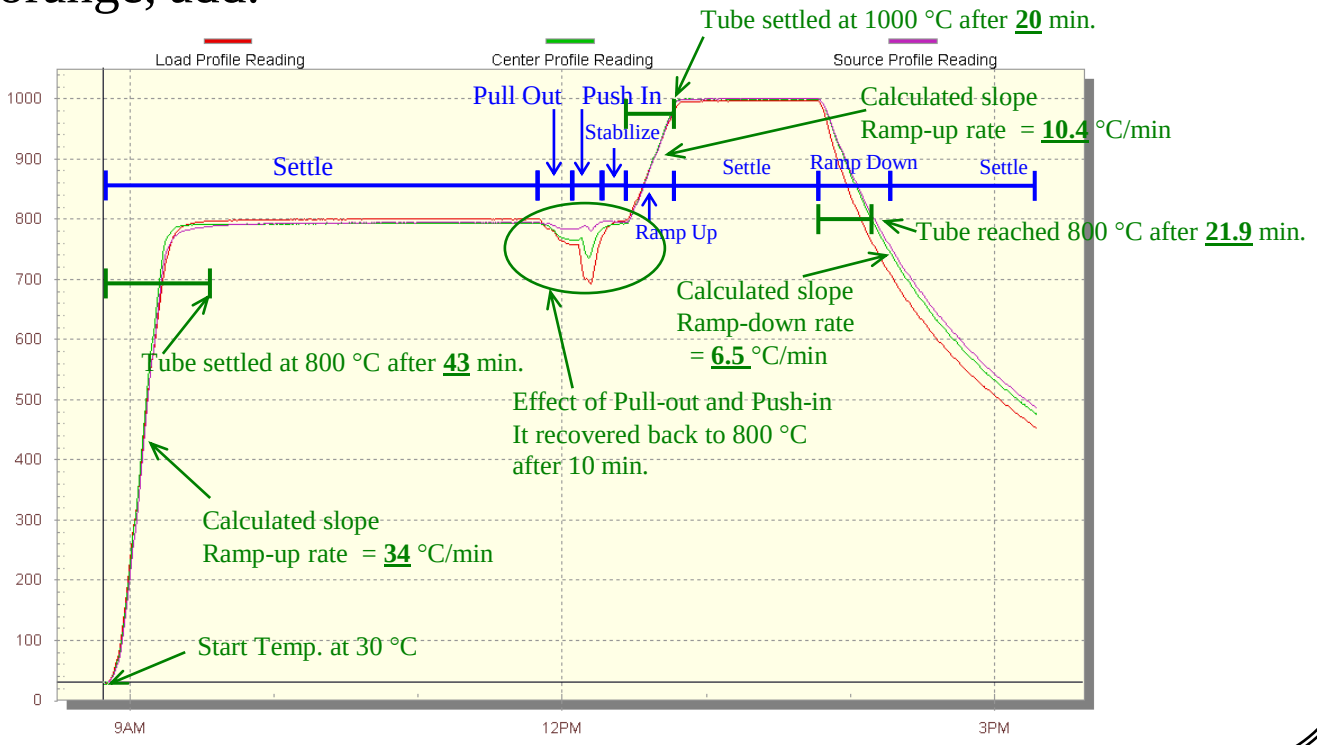




Point 1 is at flat band bias, Qfb is extracted
Point 2 is at intrinsic bias, Qox is extracted, if Qox is not equal to $Q_{FB}$ then there are interface traps, Dit is calculated from slope of region between point 1 and 3.
Point 3 is at onset of inversion where Nsc is extracted
Lifetime, Ts, is measured in inversion
P or N type is determined from shape of the curve

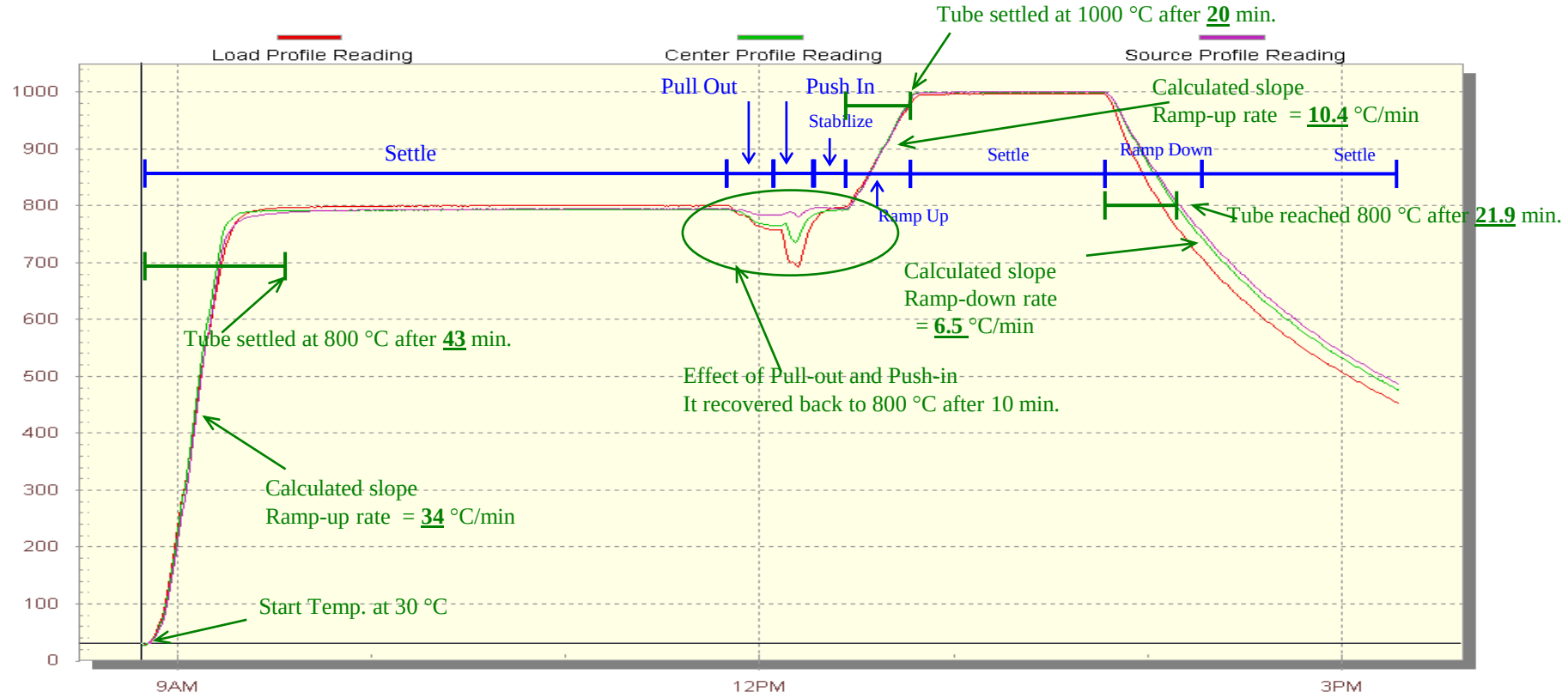
$$Q = C'V$$
$$C' = \varepsilon_o \varepsilon_r / W$$

# RECALL RUN DATA

Click on the furnace tube of interest.
Click on the graph icon on the left end of the top banner.
Select last month.
Select the furnace run of interest.
Select the items to be graphed. Example: center profile, red, add;
nitrogen flow, blue, add; oxygen flow, green, add;
hydrogen flow, orange, add.



# STABILIZE AFTER PUSH




Because of the temperature drop during pull/out and load and the push/in we need to add a stabilize step at 800C in nitrogen prior to ramp up. Include a 15 min stabilize after push/in to all recipes.

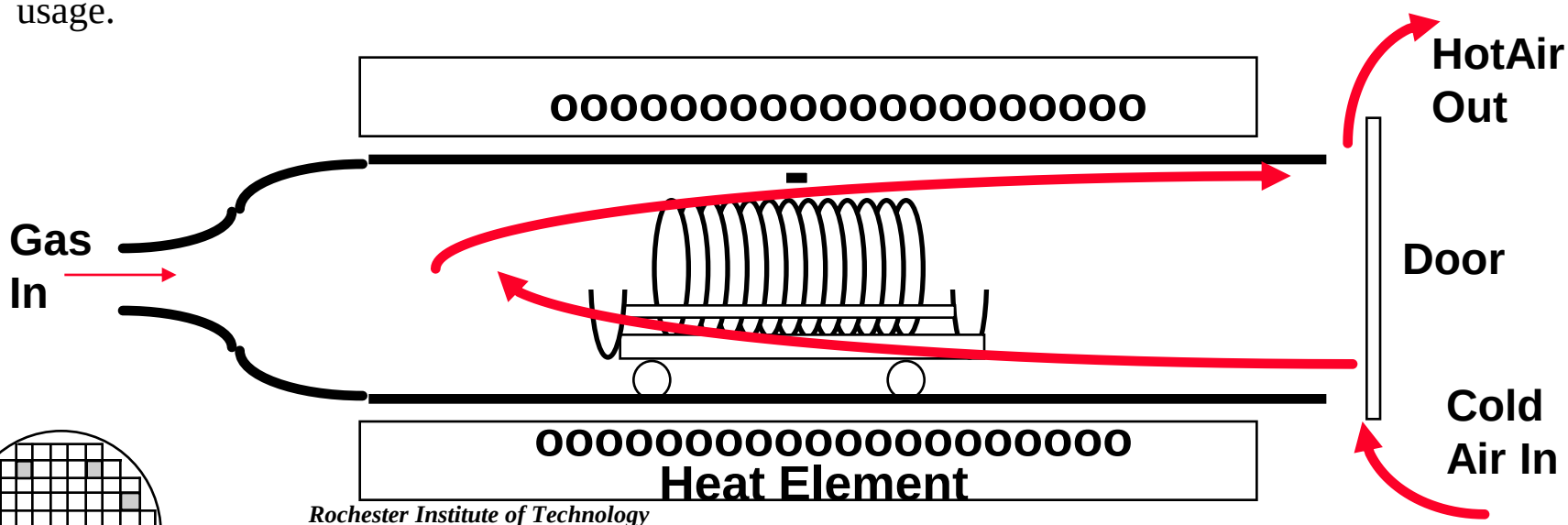
*Microelectronic Engineering*

# NON UNIFORM OXIDE GROWTH PROBLEMS

Non uniform oxide growth (top different from bottom) is often caused by not having the door closed all the way against the tube allowing room air to mix with the gas in the furnace. A similar effect is caused by having the gas flow rates too high or too low. The flow should slowly push a volume of air down the tube, without turbulence and without high velocity as it passes by the wafers. If the flow is too low then the door needs to be closed more accurately.

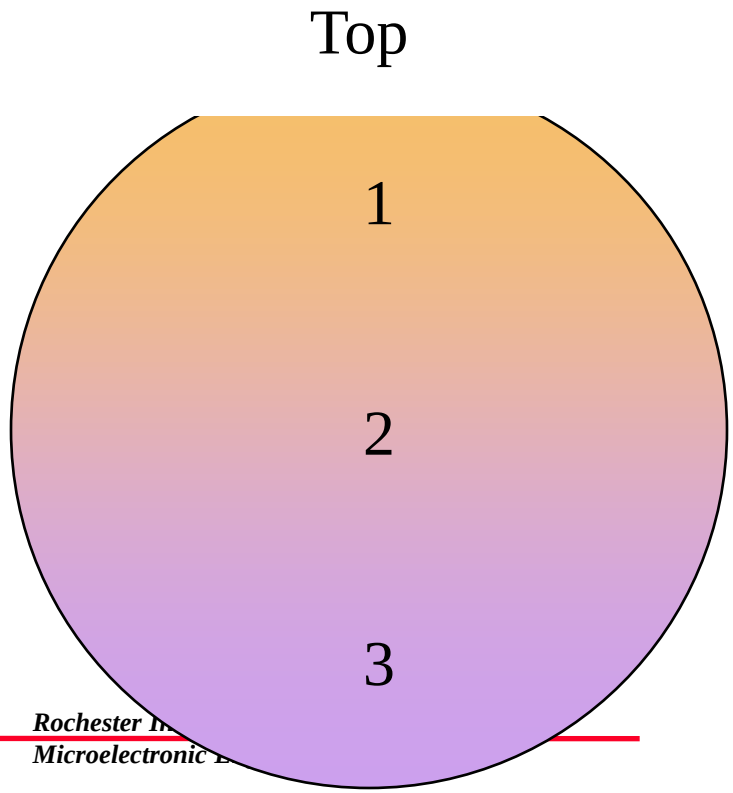
Use Total flow (lpm) = v (cm/s) x Area (cm2) x 60 (s/m) x 0.001 (l/cm3)
and let v = 1.0 cm/s. For 20 cm diameter tube Total Flow= 18 lpm

The Bruce Furnace at RIT uses flows from 5 lpm to 15 lpm, These are all on the low side to reduce gas usage.



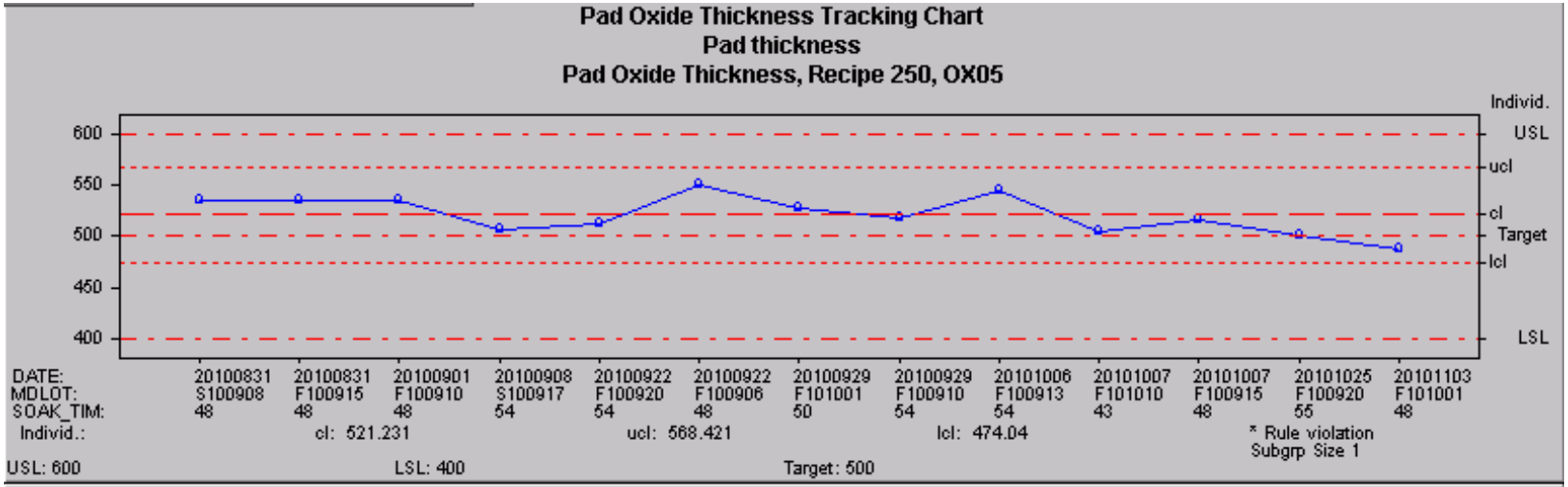
# NON UNIFORM OXIDE GROWTH PROBLEMS

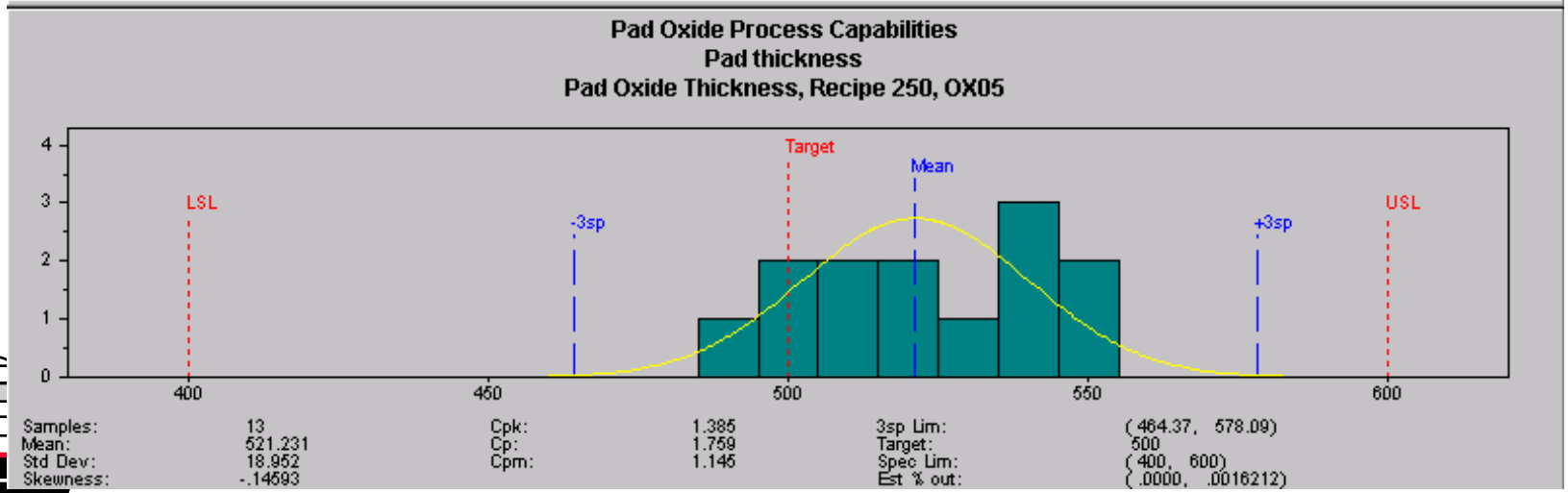
Non uniform oxide growth (top different from bottom) is often caused by not having the door closed all the way against the tube allowing room air to mix with the gas in the furnace.



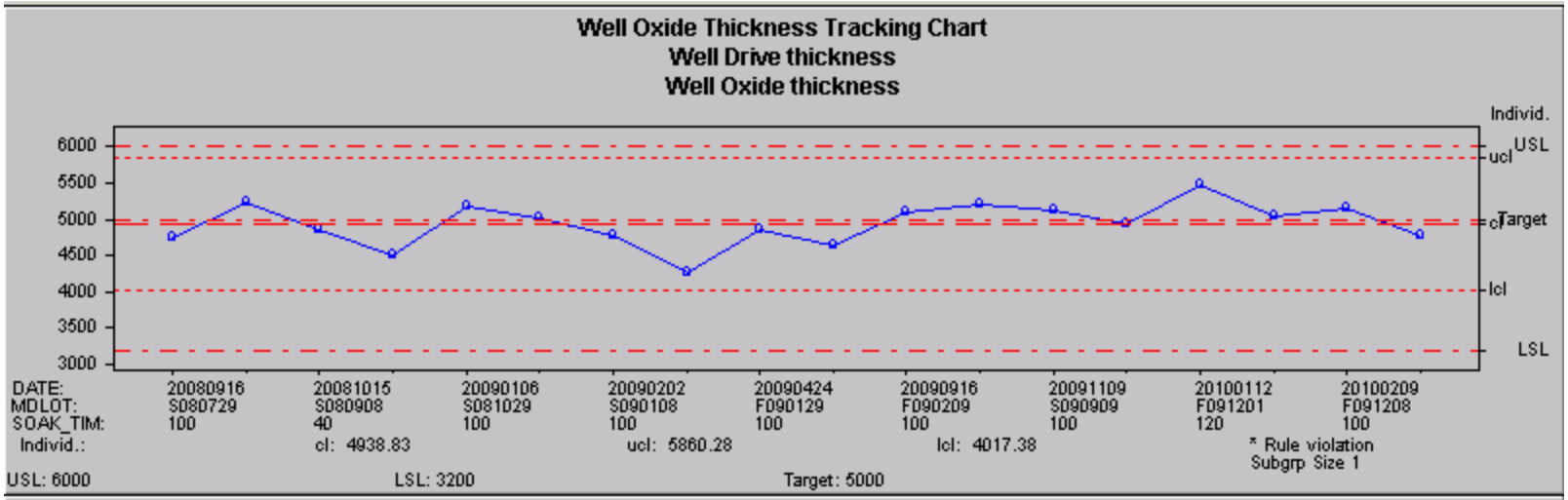

10-10-01
Recipe 350 Tube 3
Target 5000 Å
Point 1 =3980 Å
Point 2 = 3350 Å
Point 3 = 2997 Å

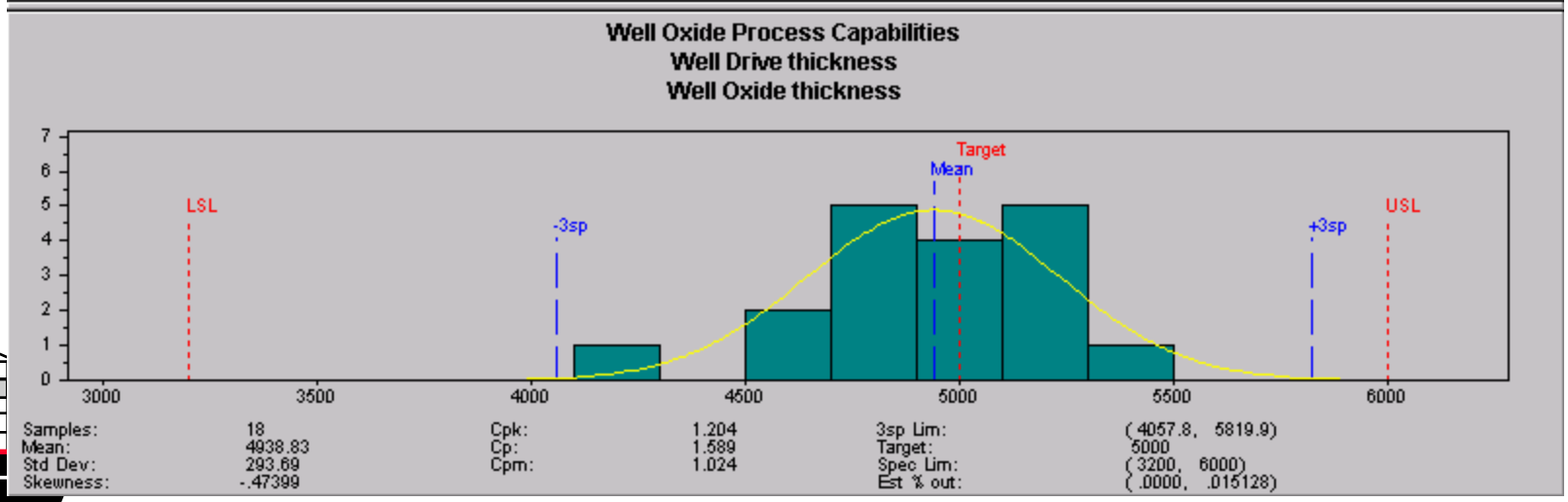
# PAD OXIDE - SPC CHART



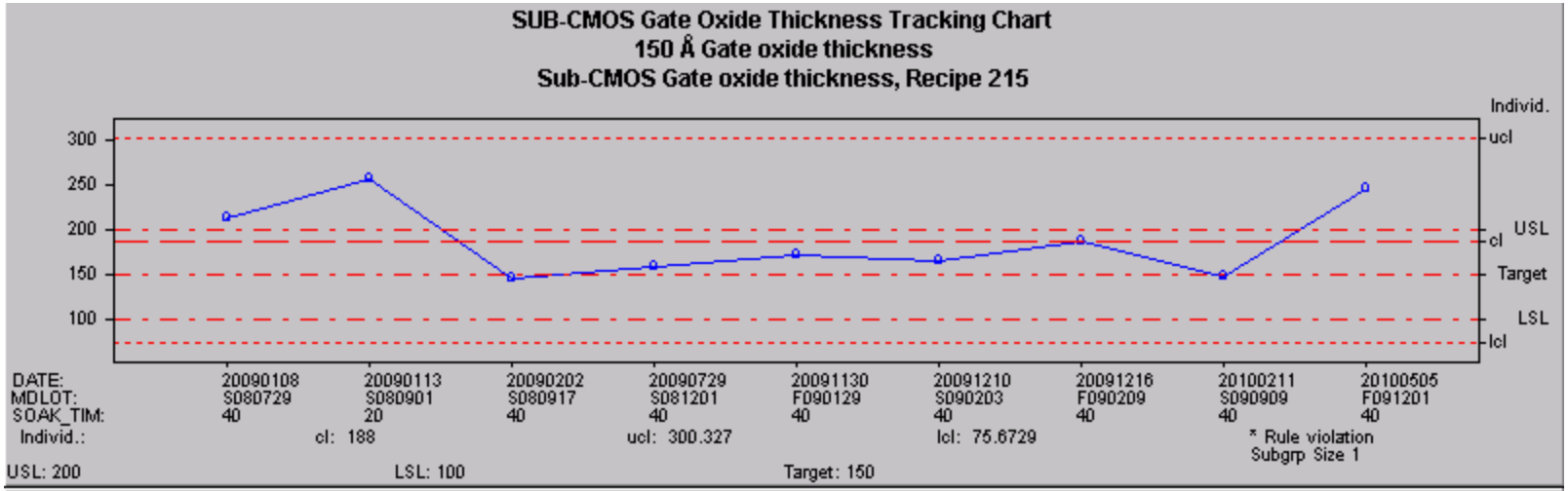



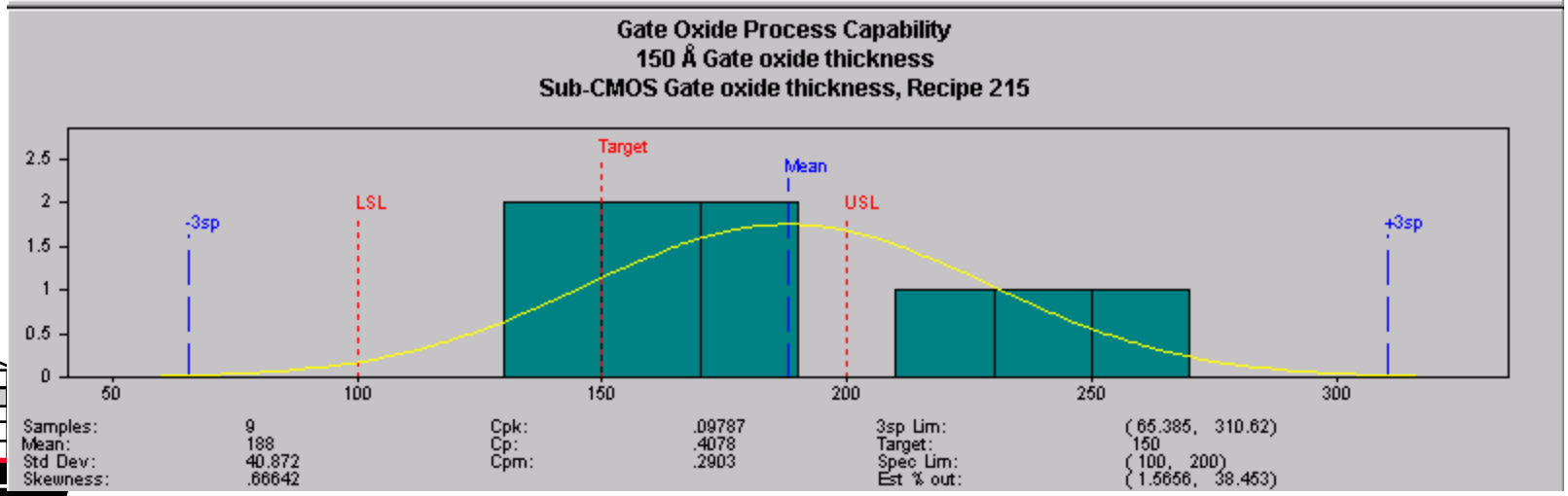
# WELL OXIDE – SPC CHART



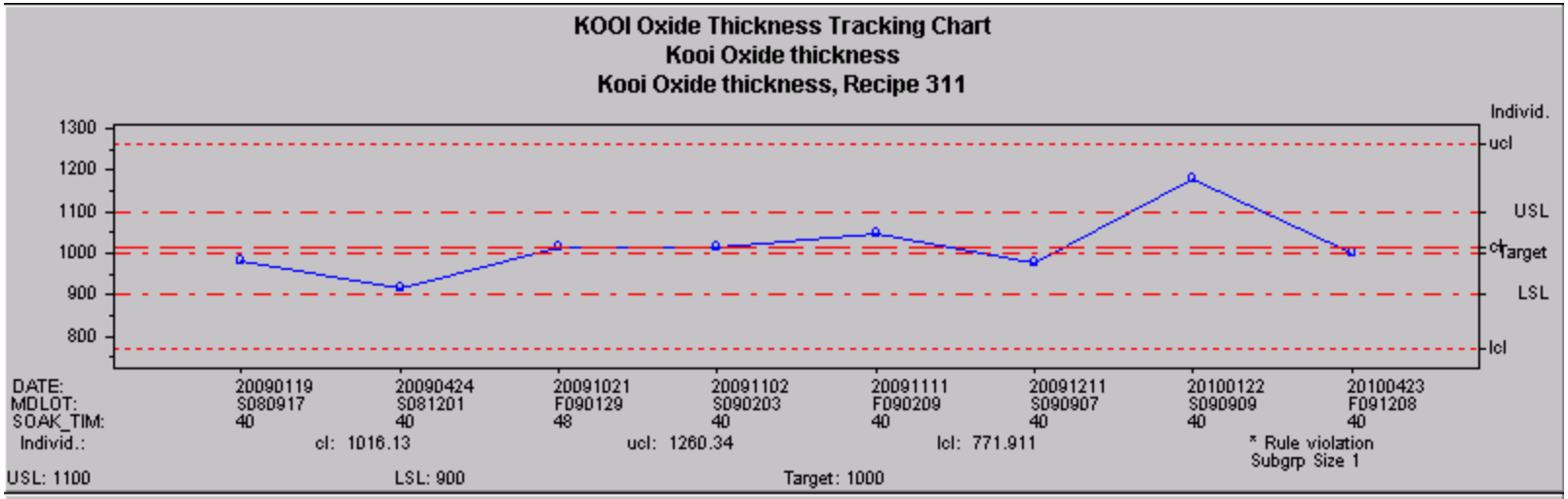



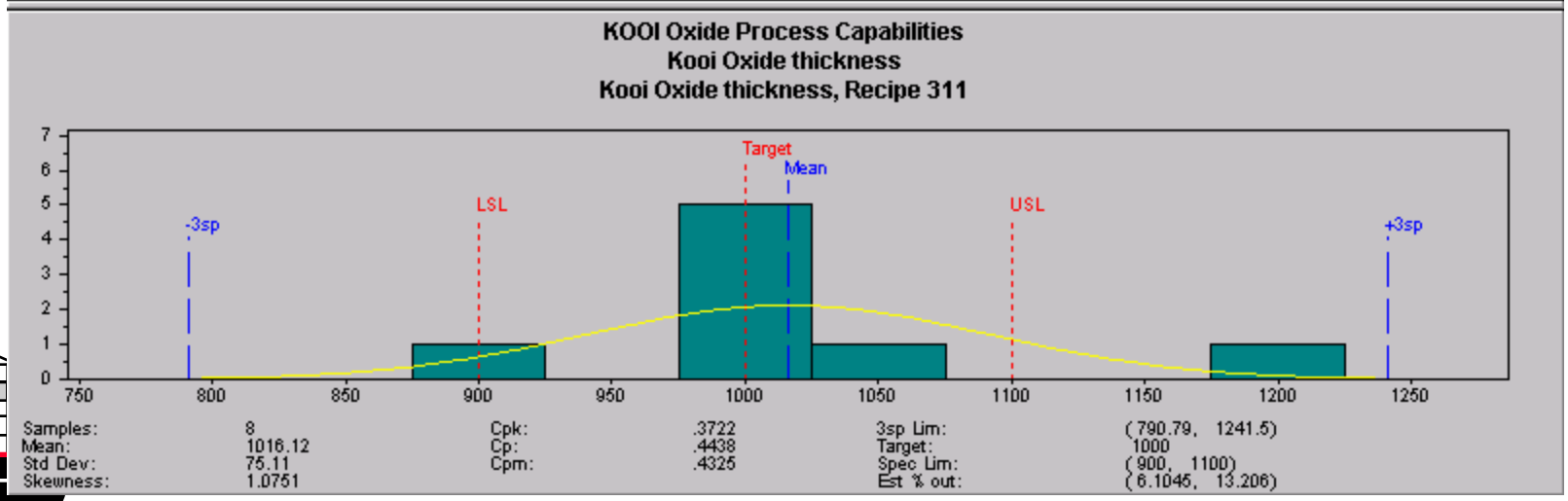
# GATE OXIDE – SPC CHART



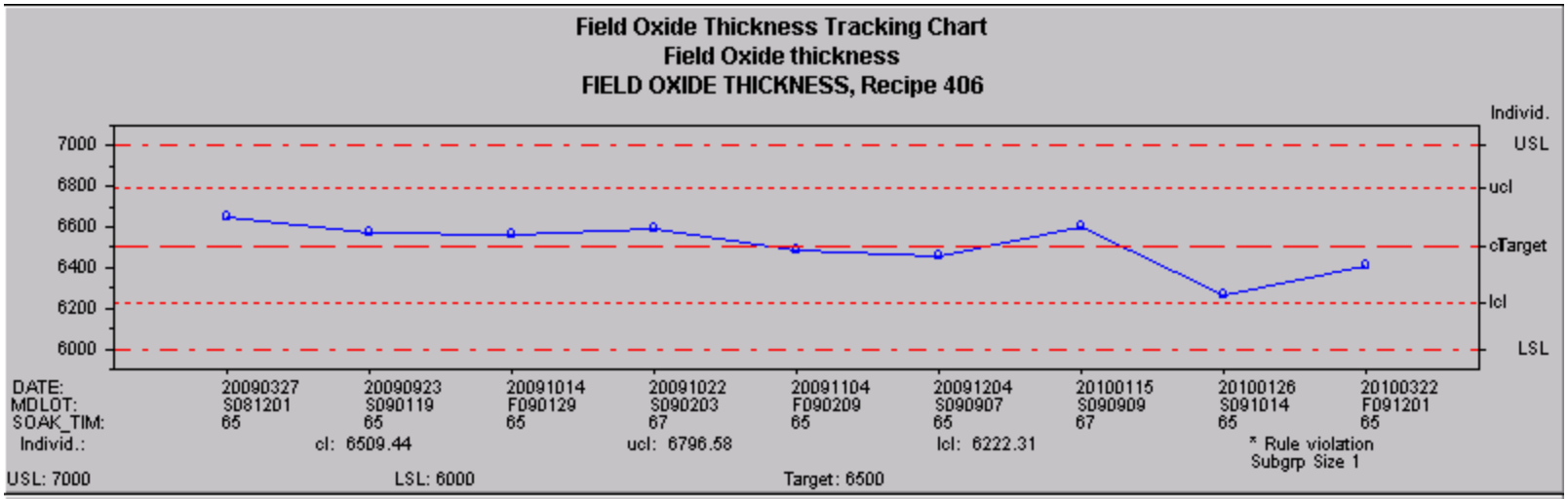



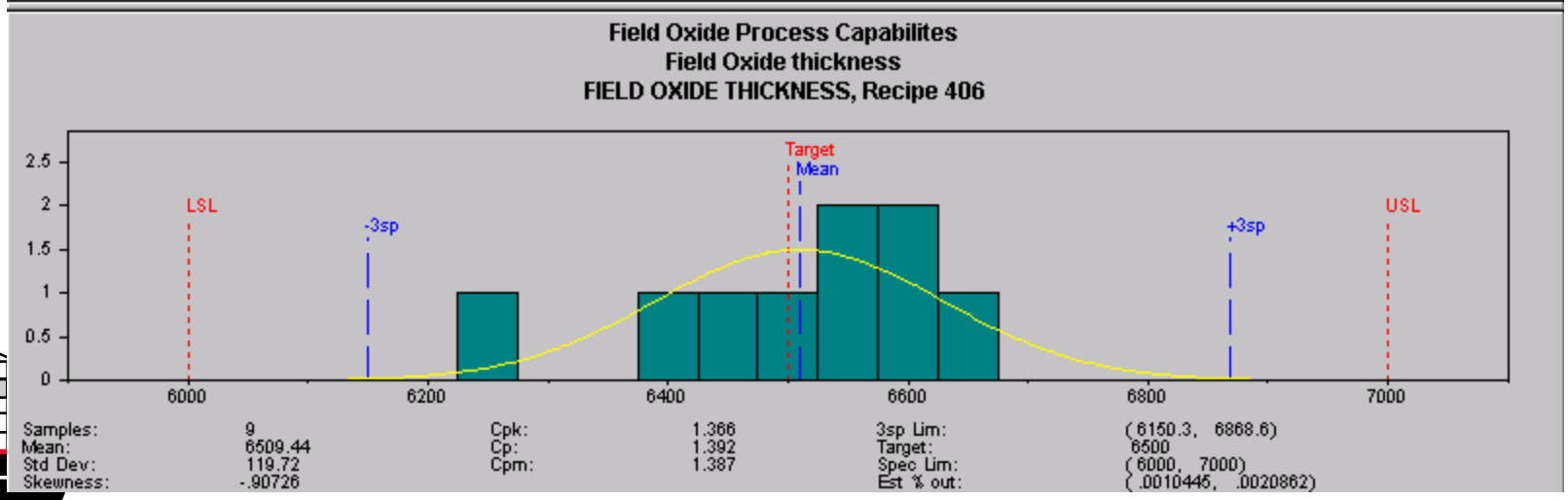
# KOOI OXIDE – SPC CHART



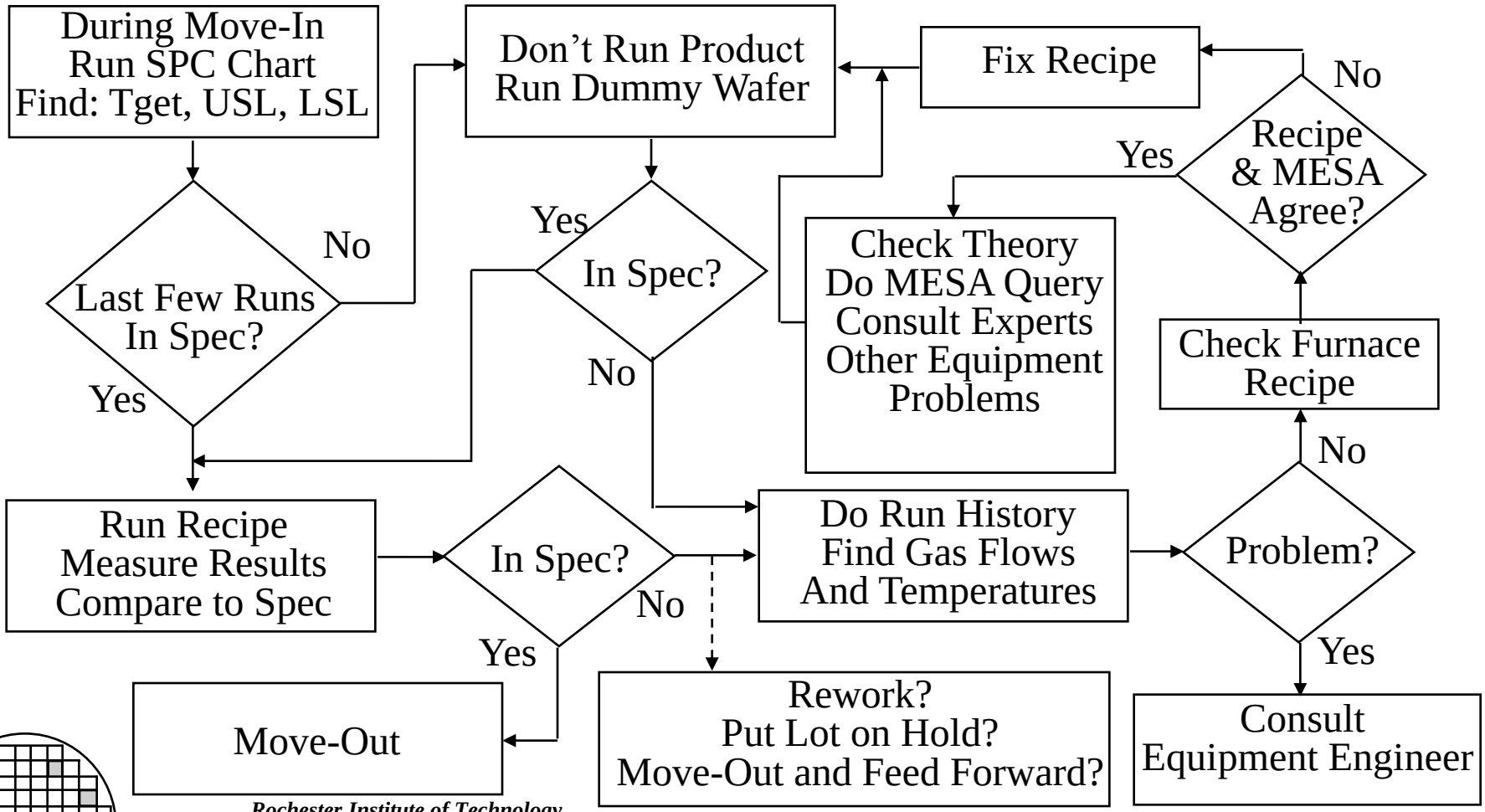



# FIELD OXIDE – SPC CHART



# OUT OF CONTROL ACTION PLAN



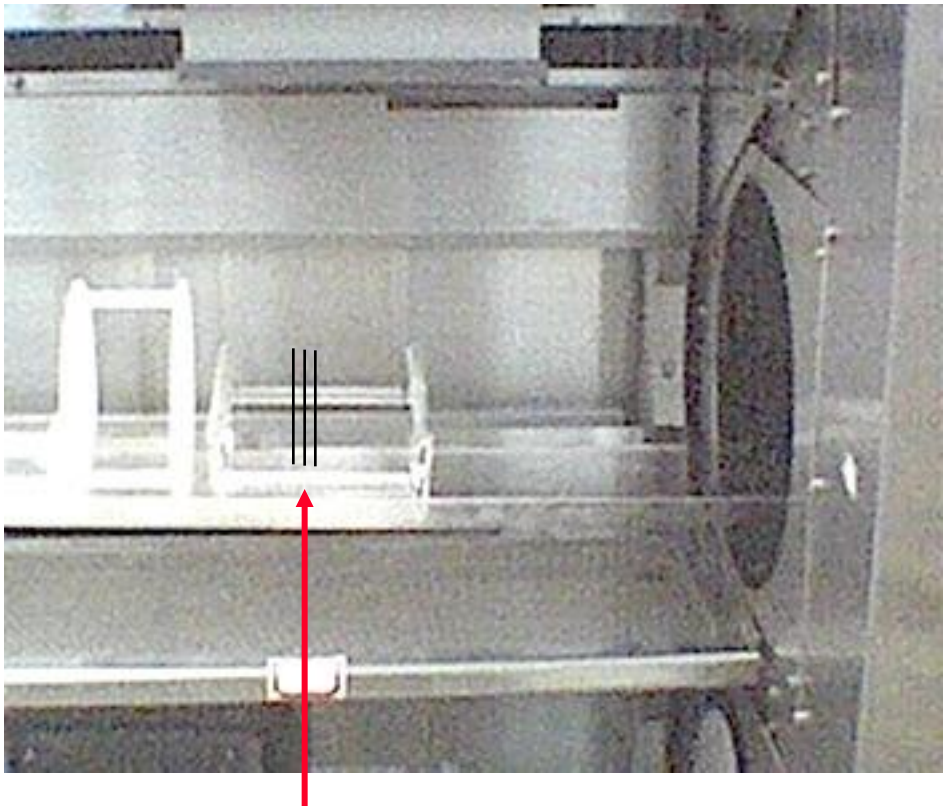
# *BAKE OF SPIN-ON DOPANT 200 °C FOR 15 MIN.*

Use quartz boat from furnace tube you plan to use.

Use holder as shown because the boat will be hot.

Do not heat wafers with photoresist on them above 150 °C

# POSITION OF WAFERS ON PADDLE



Load wafers here, when paddle is fully out.
Do not use dummy filler wafers…
the improved uniformity is negligible.

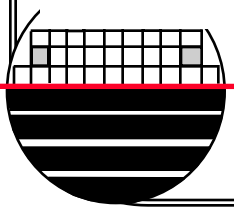
# CREATING NEW RECIPES

Log In as engineer
Find a similar recipe
Edit > Copy > new recipe name

Pick a number that has not been used
Make changes
save

# *LIST OF RECIPES FOR BRUCE FURNACE*

10 Lfull Sub CMOS Well, 1100 °C, 600 min, N2
11 Lfull Adv CMOS Well, 1100 °C, 360 min, N2
15 Lfull Well-Oxide, 1100 °C, 330 min, N2 + 25 min wet Oxide
16 Lfull TEOS Densification, 1hr. 1000°C, N2
99 Lfull Sinter, 400°C, 30min, N2/H2
101 Lfull Sinter, 450 °C, 30min, N2/H2
105 Lfull 1000 °C Anneal, 100 min, N2 only
106 Lfull Anneal sub-micron CMOS process, 900 °C, 30 min., N2
110 Lfull PMOS D/S Diffusion and Wet Ox, N2 then Wet O2
111 Lfull P+ Doping + Wet O2
115 Lfull N+ Doping + Wet O2
119 Lfull N+ Doping Thick Poly
120 Lfull N+ Poly Doping from Spin-on Source, 1000 °C, 15 min, N2
144 Lfull 1000°C Source/Drain Anneal



# *LIST OF RECIPES FOR BRUCE FURNACE*

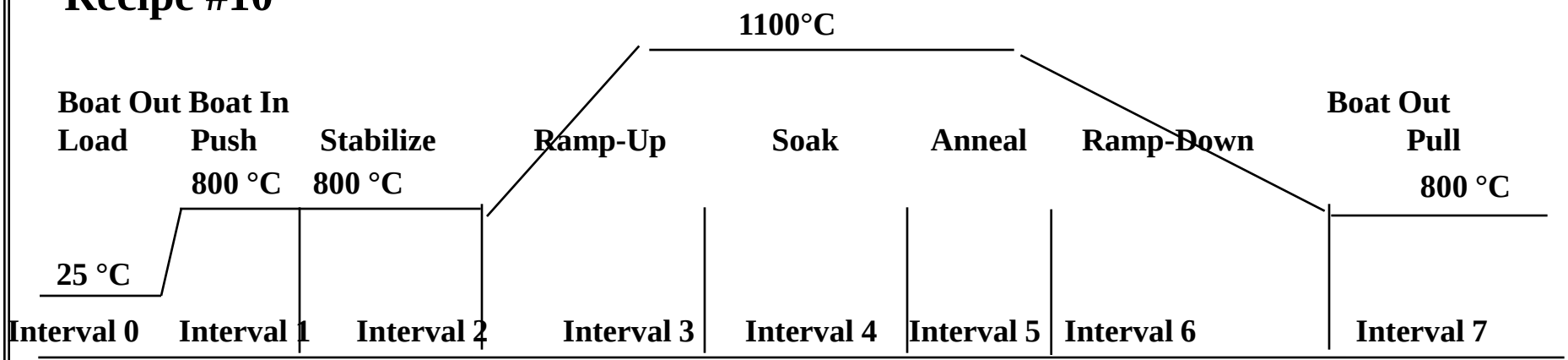
162 Lfull Well Drive SMFL-CMOS 25hr, 1100°C, N2
163 Lfull SMFL-CMOS Field Oxide, 6500Å, 950°C, Wet Oxide
175 Lfull Poly ReOxide 850°C, Wet Oxide, 15 min.
180 Lfull Well Drive P-well CMOS, 6 hrs O2, 30 hrs N2, 1100 °C
210 Lfull 100Å Gate Oxide
213 Lfull 100Å Gate Oxide with N2O
215 Lfull 150Å Gate Oxide, 900 °C, 50 min, Dry O2
225 Lfull 250Å Gate Oxide
250 Lfull 500Å Dry Oxide, 1000 °C, 56 min., soak, Gate/Pad Ox
252 Lfull Dry Oxide Var Time, 1000 °C Set your own soak time
270 Lfull 700Å Dry Oxide, 1Hr. 24min. 1000 °C soak
280 Lfull D/S Implant Anneal, 1000 °C, 20 min N2 +10 min Wet O2
284 Lfull D/S Anneal, 1000 C, 25 min. N2
310 Lfull 1,000Å Dry Oxide, 2Hr. 18min. 1000 °C soak
311 Lfull 1,000Å Kooi/Sacrificial Oxide, 900 °C, Wet O2, 40 min.

# *LIST OF RECIPES FOR BRUCE FURNACE*

330 Lfull Wet 3,000 Å Wet Oxide, 1000 °C, 50 min. soak
336 Lfull Wet 3,650 Å Wet Oxide, 1000 °C, 55 min. soak
341 Lfull Wet 4,000Å Wet Oxide, 1100 °C, 20 min. soak
350 Lfull Wet 5,000Å Wet Oxide, 1000 °C, 100 min. soak
353 Short Course 5000Å, 1100 °C, 45 min, Wet Ox
354 Short Course PreDep, 1050 °C, 5min N2 + 5 min Wet Ox
355 Short Course Gate Ox, 1100 °C, 17min, Dry O2
356 Short Course Sinter,
357 Short Course 8000Å, 1100 °C, 95 min, Wet Ox
352 Lfull Wet Ox Var Time, 1100 °C, Set your own soak time
406 Lfull 6,500Å Wet Oxide, Field Ox, 1100 °C, 65 min. soak
410 Lfull 10,000Å Wet Oxide, Field Ox, 1100 °C, 210 min. soak
430 Lfull 30,000Å Wet Oxide, Field Ox, 1100 °C, 15 Hr. soak
440 Lfull 40,000Å Wet Oxide, Field Ox, 1100 °C, 35 Hr. soak
463 SMFL TransLC Tube Clean, Tube 4
474 Lfull SMFL CMOS 310Å Gate Oxide, N2/O2, 1000C,15 min.

# BRUCE FURNACE RECIPE 10 SUB-CMOS WELL DRIVE

## Recipe #10



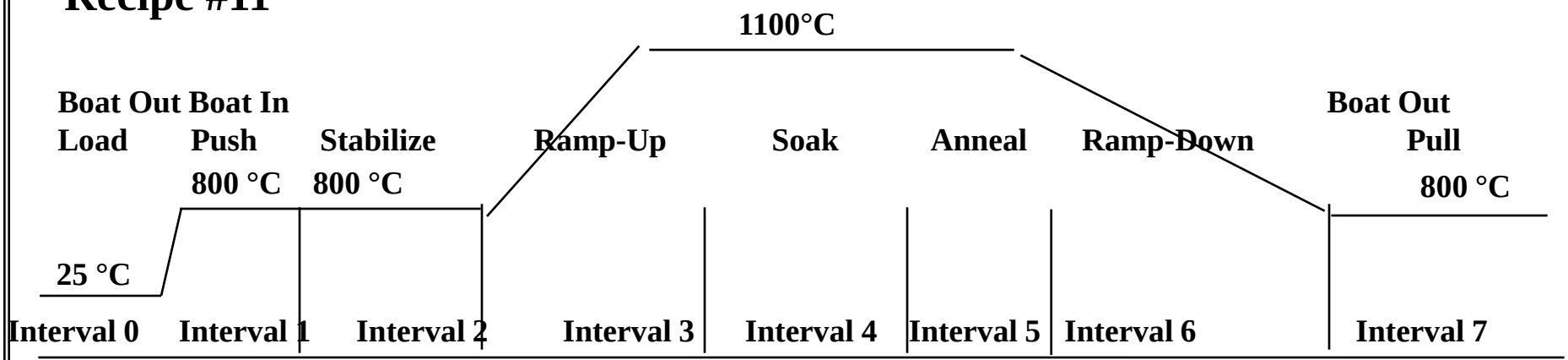

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Any | 12 min | 15 min | 30 min | 600 min | 5 min | 60 min | 12 min |
| 0 lpm | 10 lmp | 10 lpm | 10 lpm | 10 lpm | 10 lpm | 10 lpm | 5 lpm |
| none | N2 | N2 | N2 | N2 | N2 | N2 | N2 |

At the end of a run the furnace returns to Interval 0 which is set for boat out, 25 °C and no gas flow. The furnace waits in that state until someone aborts the current recipe or loads a new recipe.

**Sub-CMOS Well Drive, No Oxide Growth, Tube 1**

# BRUCE FURNACE RECIPE 11 ADV-CMOS WELL DRIVE

## Recipe #11



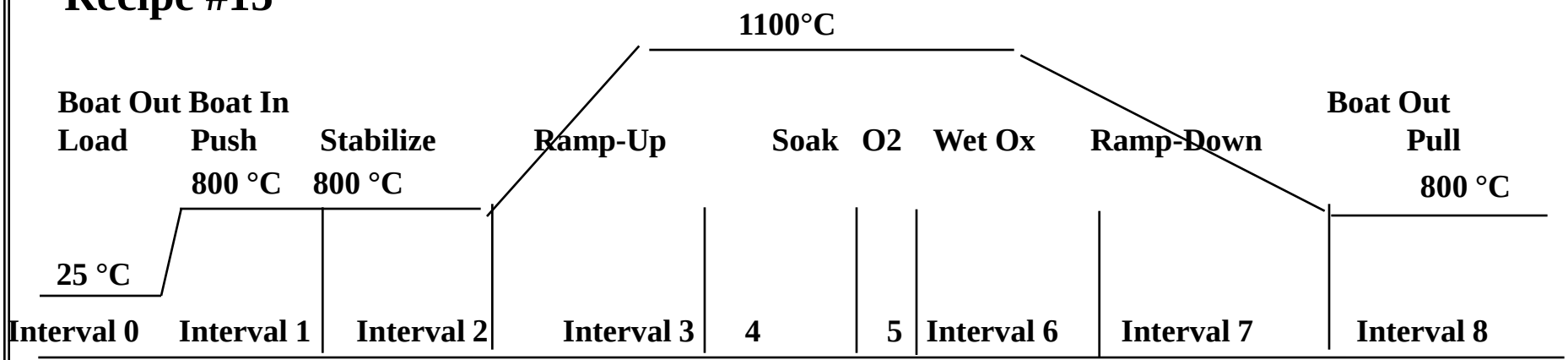

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Any | 12 min | 15 min | 30 min | 360 min | 5 min | 60 min | 12 min |
| 0 lpm | 10 lmp | 10 lpm | 10 lpm | 10 lpm | 10 lpm | 10 lpm | 5 lpm |
| none | N2 | N2 | N2 | N2 | N2 | N2 | N2 |

At the end of a run the furnace returns to Interval 0 which is set for boat out, 25 °C and no gas flow. The furnace waits in that state until someone aborts the current recipe or loads a new recipe.

**Adv-CMOS Well Drive, No Oxide Growth, Tube 1**

# BRUCE FURNACE RECIPE 11 ADV-CMOS WELL DRIVE

## Recipe #15



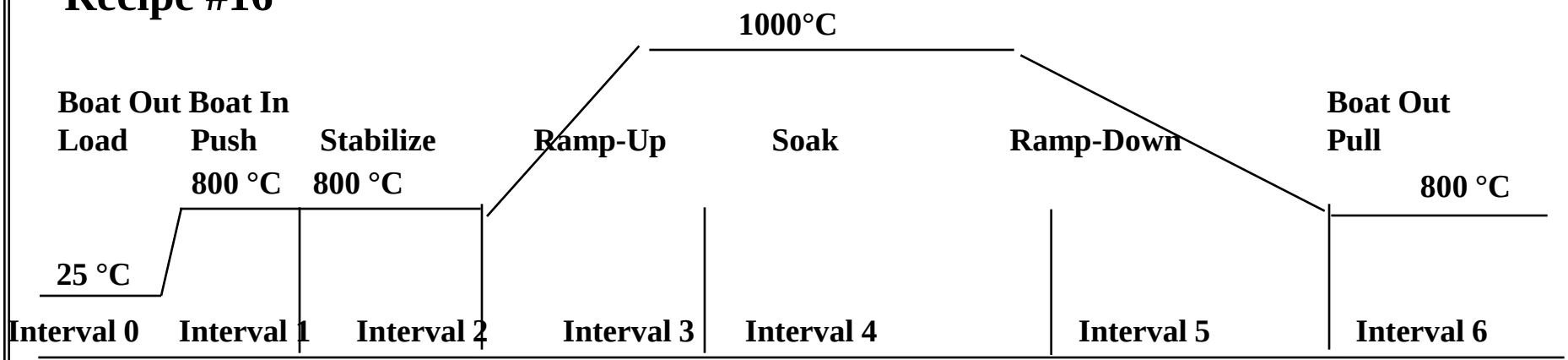

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Any | 12 min | 15 min | 30 min | 330 min | 5 min | 25 min | 60 min | 12 min |
| 0 lpm | 10 lmp | 10 lpm | 10 lpm | 10 lpm | 10 lpm | 3.6/2 lpm | 10 lpm | 5 lpm |
| none | N2 | N2 | N2 | N2 | O2 | H2/N2 | N2 | N2 |

At the end of a run the furnace returns to Interval 0 which is set for boat out, 25 °C and no gas flow. The furnace waits in that state until someone aborts the current recipe or loads a new recipe.

**CMOS Well Drive, 3000Å Wet Oxide Growth, Tube 1**

# BRUCE FURNACE RECIPE 16 ADV-CMOS WELL DRIVE

## Recipe #16



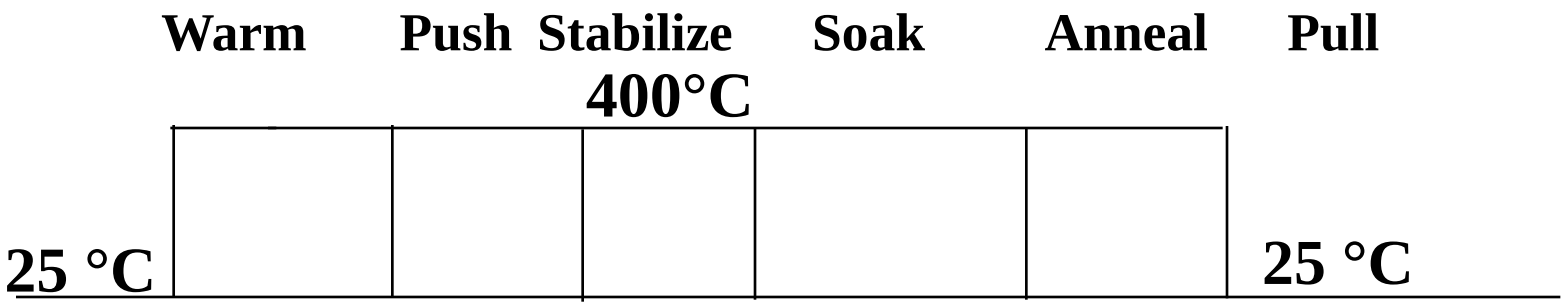

| | | | | | | |
|---|---|---|---|---|---|---|
| Any | 12 min | 20 min | 30 min | 60 min | 40 min | 15 min |
| 0 lpm | 10 lmp | 10 lpm | 10 lpm | 10 lpm | 10 lpm | 5 lpm |
| none | N2 | N2 | N2 | N2 | N2 | N2 |

At the end of a run the furnace returns to Interval 0 which is set for boat out, 25 °C and no gas flow. The furnace waits in that state until someone aborts the current recipe or loads a new recipe.

**Adv-CMOS Well Drive, No Oxide Growth, Tube 1**

# BRUCE FURNACE RECIPE 99 SINTER

**SINTER Recipe #99**



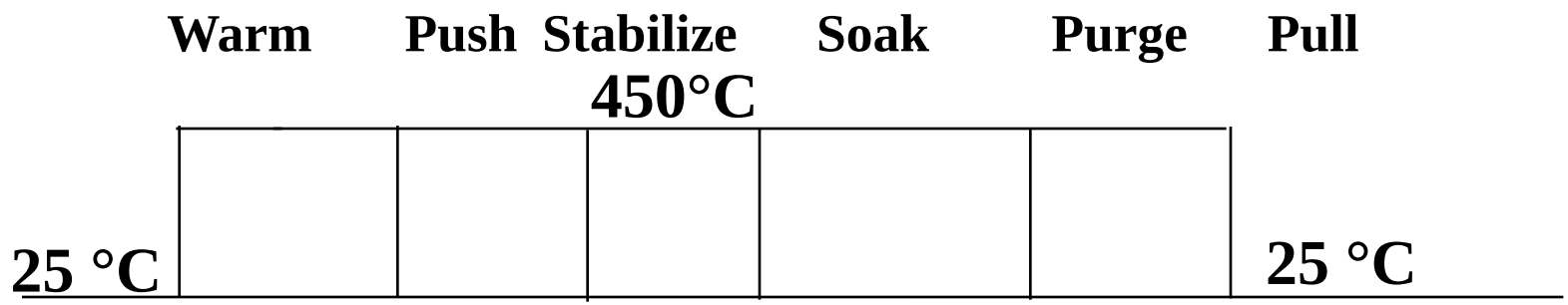

| Interval | 0 | 1 | 2 | 3 | 4 | 5 | 6 | |
|---|---|---|---|---|---|---|---|---|
| Any` | | 60 | 30 | 15 | 15 | 5 | 15 | min |
| 0 lmp | | 10 | 10 | 10 | 5 | 10 | 5 | lpm |
| None | | N2 | N2 | N2 | N2/H2 | N2 | N2 | |

At the end of a run the furnace returns to Interval 0 which is set for boat out, 25 °C and no gas flow. The furnace waits in that state until someone aborts the current recipe or loads a new recipe.

# BRUCE FURNACE RECIPE 101 SINTER

**SINTER Recipe #101**

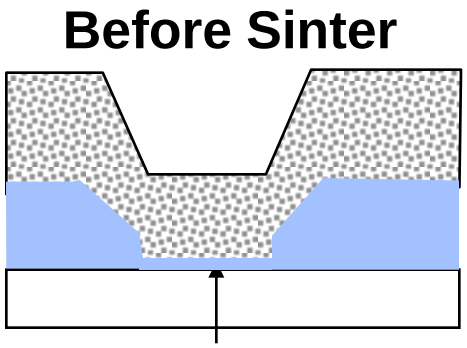
Verified:8-20-08



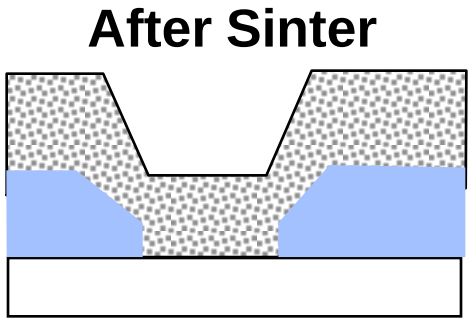

| Interval | 0 | 1 | 2 | 3 | 4 | 5 | 6 | |
|---|---|---|---|---|---|---|---|---|
| Any` | | 60 | 30 | 15 | 15 | 5 | 15 | min |
| 0 lmp | | 10 | 10 | 10 | 5 | 10 | 5 | lpm |
| None | | N2 | N2 | N2/H2 | N2/H2 | N2 | N2 | |

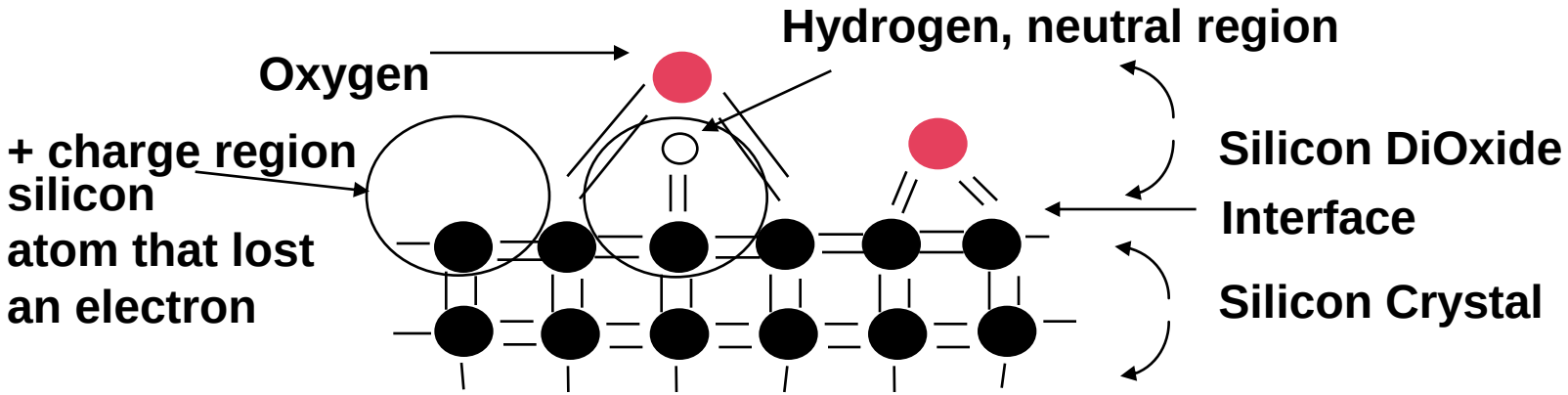
At the end of a run the furnace returns to Interval 0 which is set for boat out, 25 °C and no gas flow. The furnace waits in that state until someone aborts the current recipe or loads a new recipe.

# SINTER




***Reduce Contact Resistance***



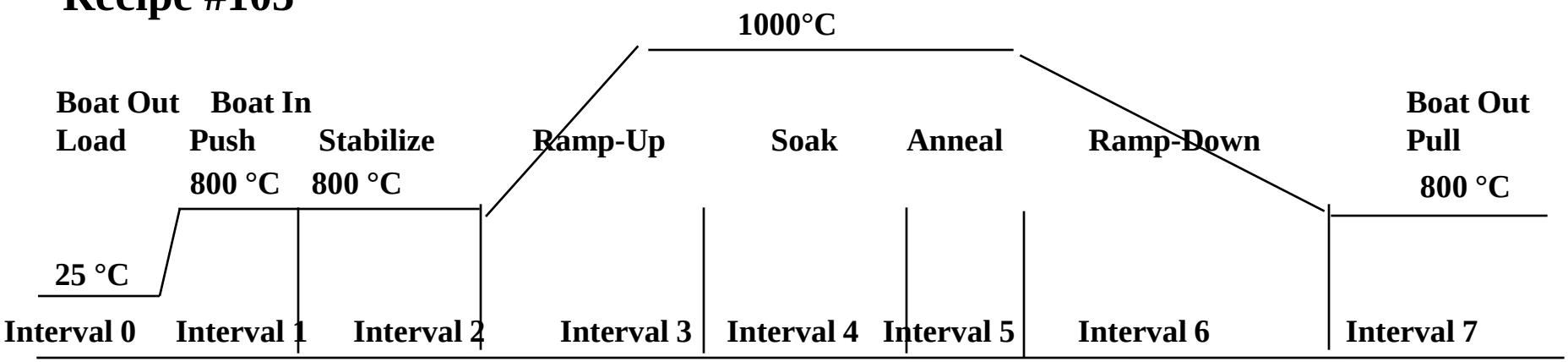




***Reduce Surface States***

# BRUCE FURNACE RECIPE 105 – 1000°C ANNEAL

Verified:2-24-04

## Recipe #105




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Any | 12 min | 15 min | 20 min | 100 min | 5 min | 40 min | 12 min |
| 0 lpm | 10 lmp | 10 lpm | 10 lpm | 15 lpm | 10 lpm | 10 lpm | 5 lpm |
| none | N2 | N2 | N2 | N2 | N2 | N2 | N2 |

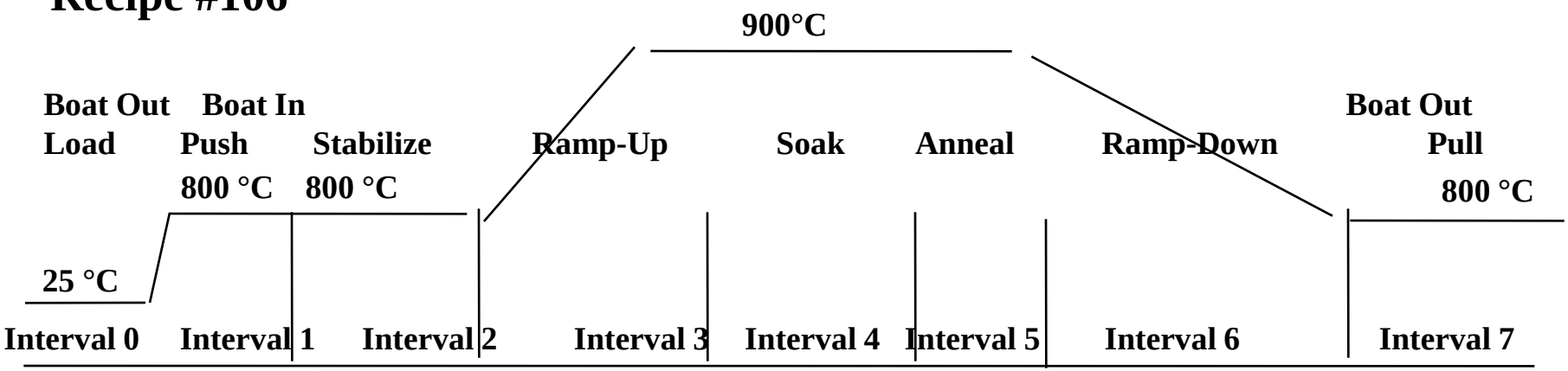
At the end of a run the furnace returns to Interval 0 which is set for boat out, 25 °C and no gas flow. The furnace waits in that state until someone aborts the current recipe or loads a new recipe.

**1000°C Anneal, No Oxide Growth**

# BRUCE FURNACE RECIPE 106 – 900°C ANNEAL

Verified:2-24-04

**Recipe #106**




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Any | 12 min | 15 min | 10 min | 30 min | 5 min | 20 min | 12 min |
| 0 lpm | 10 lmp | 10 lpm | 10 lpm | 15 lpm | 10 lpm | 10 lpm | 5 lpm |
| none | N2 | N2 | N2 | N2 | N2 | N2 | N2 |

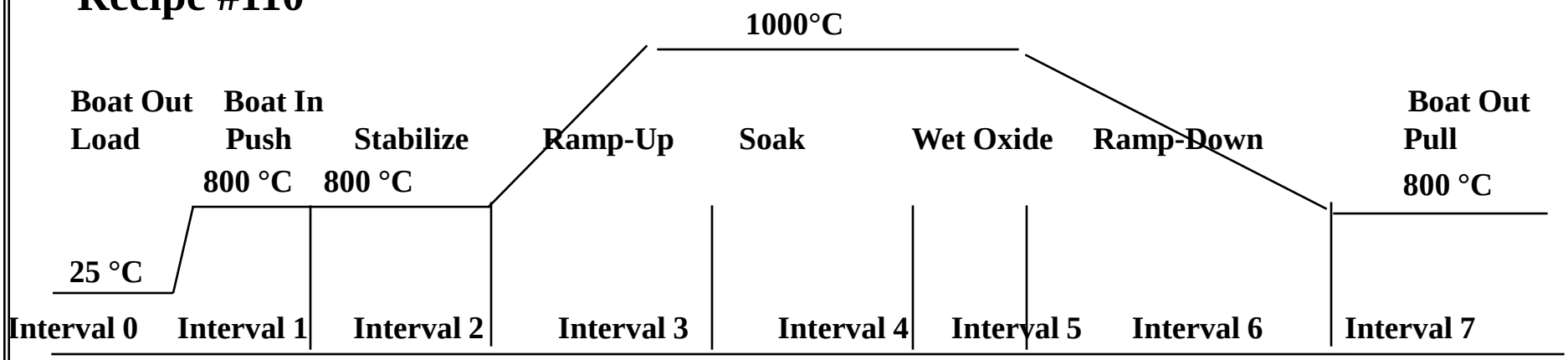
At the end of a run the furnace returns to Interval 0 which is set for boat out, 25 °C and no gas flow. The furnace waits in that state until someone aborts the current recipe or loads a new recipe.

**900°C Anneal, No Oxide Growth**

# BRUCE FURNACE RECIPE 110 PMOS D/S &WET O2

Verified:2-24-04

## Recipe #110




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Any | 12 min | 15 min | 20 min | 20 min | 30 min | 40 min | 12 min |
| 0 lpm | 10 lpm | 10 lpm | 10 lpm | 10 lpm | 2/3.6 lpm | 10 lpm | 5 lpm |
| none | N2 | N2 | N2 | N2 | O2/H2 | N2 | N2 |

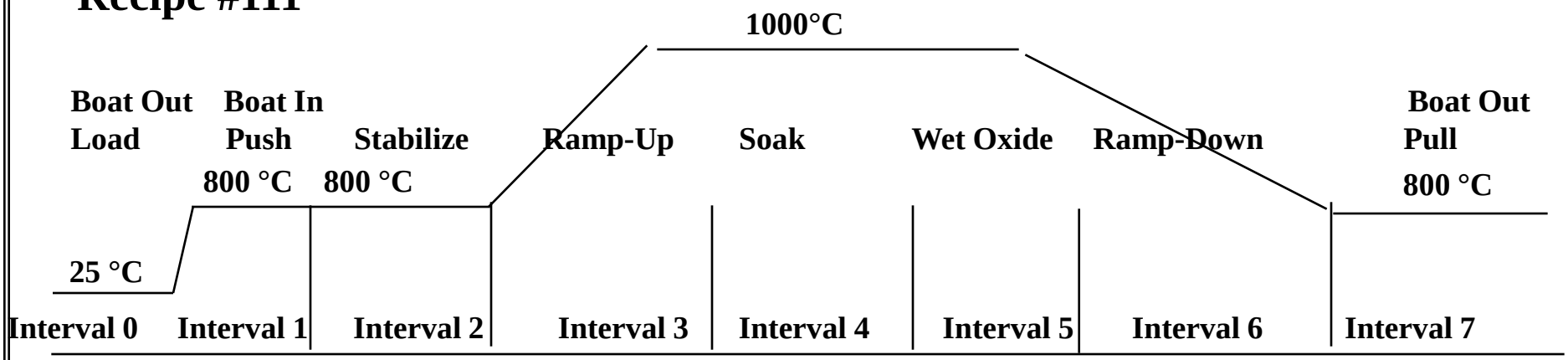
At the end of a run the furnace returns to Interval 0 which is set for boat out, 25 °C and no gas flow. The furnace waits in that state until someone aborts the current recipe or loads a new recipe.

**PMOS D/S Diffusion plusWet Oxide Growth**

# BRUCE FURNACE RECIPE 111 P+ POLY DOPE

Verified:2-24-04

**Recipe #111**




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Any | 12 min | 15 min | 20 min | 15 min | 10 min | 40 min | 12 min |
| 0 lpm | 10 lpm | 10 lpm | 10 lpm | 10 lpm | 2/3.6 lpm | 10 lpm | 5 lpm |
| none | N2 | N2 | N2 | N2 | O2/H2 | N2 | N2 |

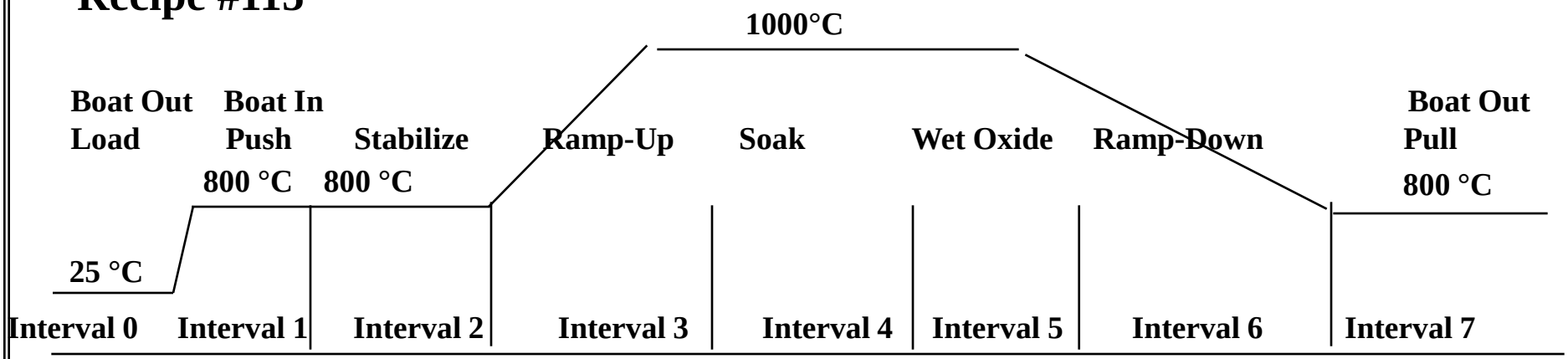
At the end of a run the furnace returns to Interval 0 which is set for boat out, 25 °C and no gas flow. The furnace waits in that state until someone aborts the current recipe or loads a new recipe.

**P-Type Poly Dope plus Wet Oxide Growth**

# BRUCE FURNACE RECIPE 115 N+ DIFF &WET O2

Verified:2-24-04

**Recipe #115**




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Any | 12 min | 15 min | 20 min | 30 min | 30 min | 40 min | 12 min |
| 0 lpm | 10 lpm | 10 lpm | 10 lpm | 10 lpm | 2/3.6 lpm | 10 lpm | 5 lpm |
| none | N2 | N2 | N2 | N2 | O2/H2 | N2 | N2 |

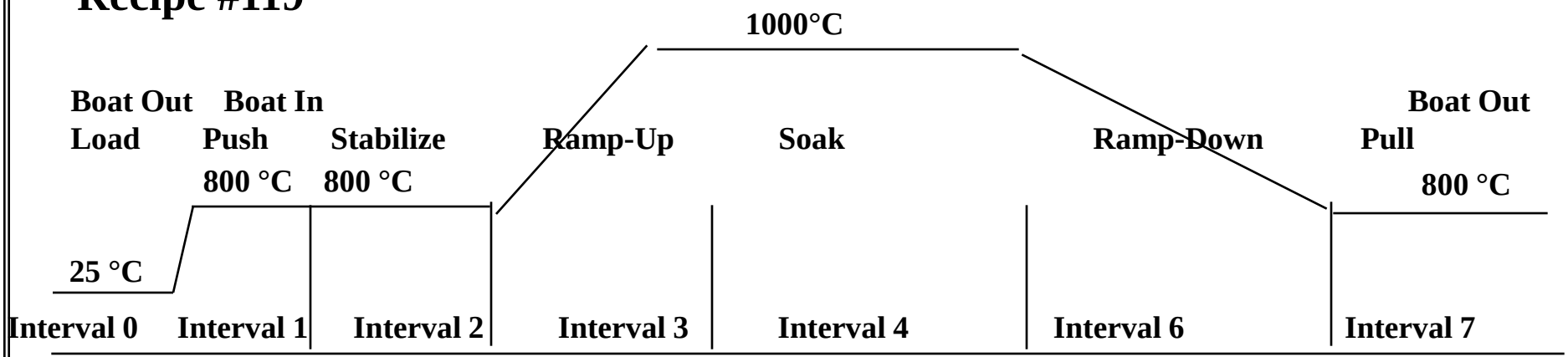
At the end of a run the furnace returns to Interval 0 which is set for boat out, 25 °C and no gas flow. The furnace waits in that state until someone aborts the current recipe or loads a new recipe.

**N+ Diffusion plus Wet Oxide Growth, Target 2854 Å**

# BRUCE FURNACE RECIPE 119 – N++ POLY DOPE

Verified:2-24-04

**Recipe #119**




| Any | 12 min | 15 min | 20 min | 30 min | 40 min | 15 min |
|---|---|---|---|---|---|---|
| 0 lpm | 10 lpm | 10 lmp | 5 lpm | 10 lpm | 10 lpm | 5 lpm |
| none | N2 | N2 | N2 | N2 | N2 | N2 |

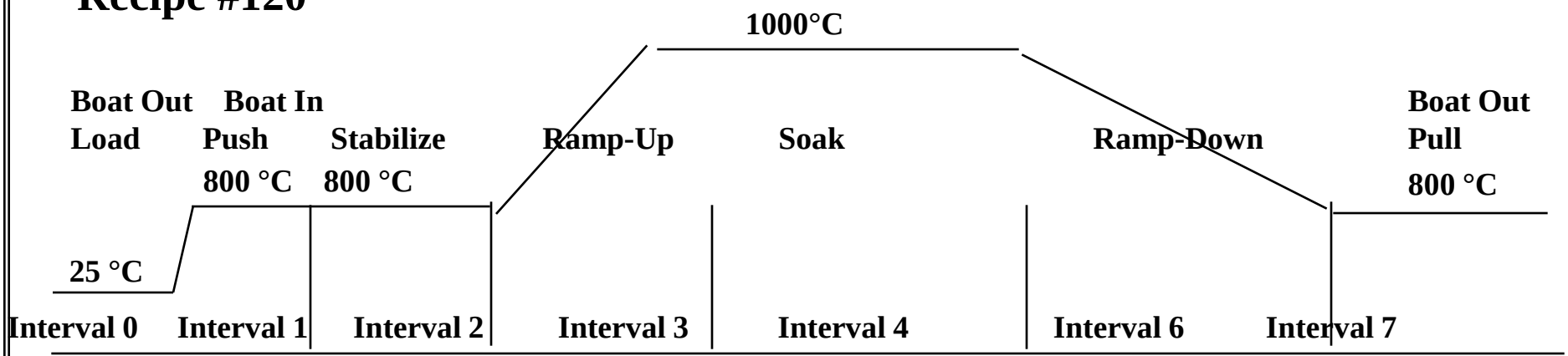
At the end of a run the furnace returns to Interval 0 which is set for boat out, 25 °C and no gas flow. The furnace waits in that state until someone aborts the current recipe or loads a new recipe.

**N+ Poly Doping, Thick Poly, > 1 µm, No Oxide Growth**

# BRUCE FURNACE RECIPE 120- N+ POLY DOPE

Verified:2-24-04

## Recipe #120



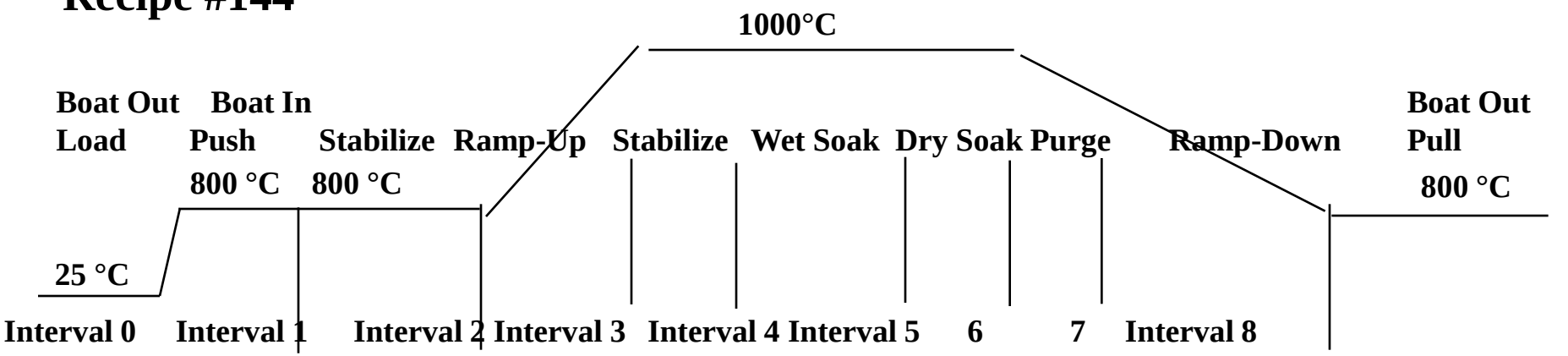

| | | | | | | |
|---|---|---|---|---|---|---|
| Any | 12 min | 15 min | 20 min | 15 min | 40 min | 15 min |
| 0 lpm | 10 lpm | 10 lmp | 5 lpm | 10 lpm | 10 lpm | 5 lpm |
| none | N2 | N2 | N2 | N2 | N2 | N2 |

At the end of a run the furnace returns to Interval 0 which is set for boat out, 25 °C and no gas flow. The furnace waits in that state until someone aborts the current recipe or loads a new recipe.

**N+ Poly Doping, Thin Poly, < 1 µm, No Oxide Growth**

# BRUCE FURNACE RECIPE 144 – 1000°C S/D ANNEAL

## Recipe #144



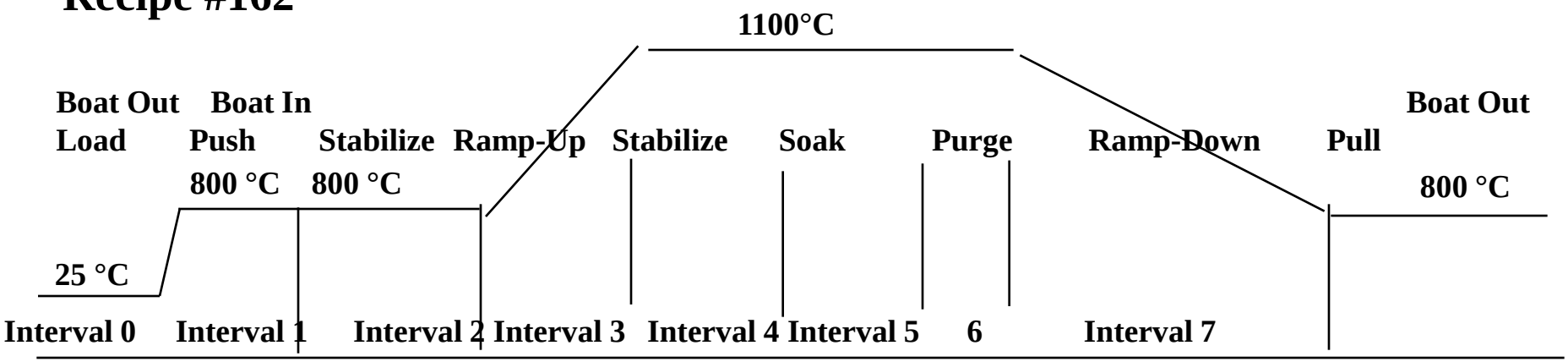

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Any | 12 min | 20 min | 20 min | 10 min | 10 min | 5 min | 5 min | 35 min |
| 0 lpm | 10 lmp | 10 lpm | 10 lpm | 10 lpm | 3.6/2 lpm | 10 lpm | 15 lpm | 10 lpm |
| none | N2 | N2 | N2 | N2 | H2/O2 | O2 | N2 | N2 |

At the end of a run the furnace returns to Interval 0 which is set for boat out, 25 °C and no gas flow. The furnace waits in that state until someone aborts the current recipe or loads a new recipe.

**1000°C Anneal, With Oxide Growth**

# BRUCE FURNACE RECIPE 162 – 1100°C 25HR WELL DRIVE

## Recipe #162



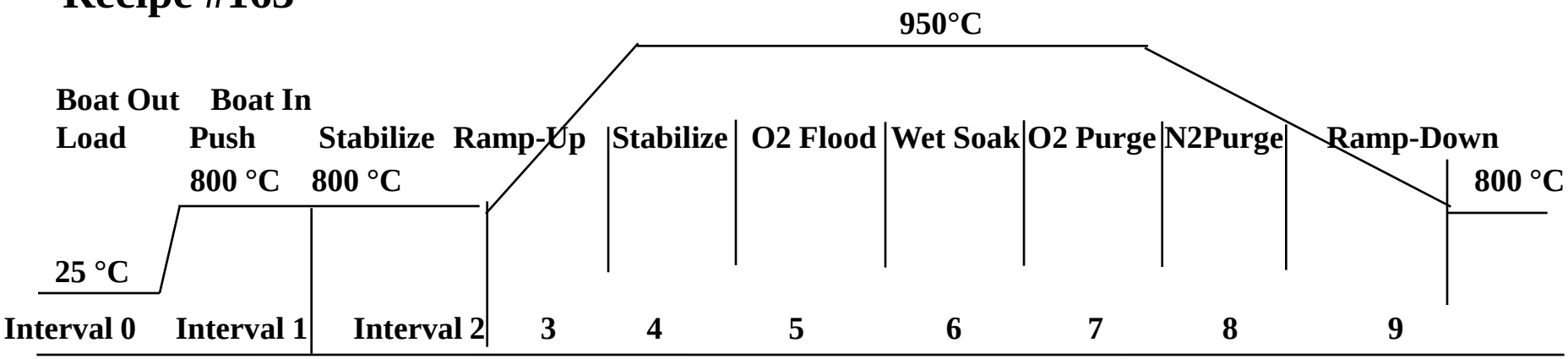

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Any | 12 min | 20 min | 30 min | 60 min | 25 Hours | 5 min | 45 min |
| 0 lpm | 10 lmp | 10 lpm | 10 lpm | 10 lpm | 10 lpm | 15 lpm | 10 lpm |
| none | N2 | N2 | N2 | N2 | N2 | N2 | N2 |

At the end of a run the furnace returns to Interval 0 which is set for boat out, 25 °C and no gas flow. The furnace waits in that state until someone aborts the current recipe or loads a new recipe.

**1100°C Well Drive, No Oxide Growth**

# BRUCE FURNACE RECIPE 163 – 950°C 6500Ã FIELD OX

## Recipe #163



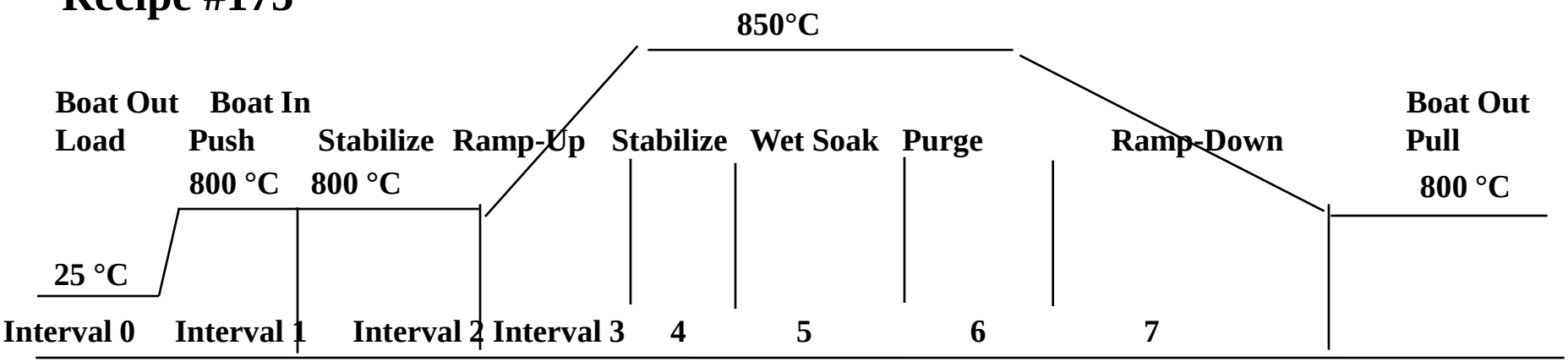

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Any | 12 min | 20 min | 15 min | 10 min | 5 min | 5 hours | 5 min | 20 min | 20 min |
| 0 lpm | 10 lmp | 10 lpm | 5 lpm | 5 lpm | 5 lpm | 3.6/2 lpm | 5 lpm | 15 lpm | 10 lpm |
| none | N2 | N2 | N2 | N2 | O2 | H2/O2 | O2 | N2 | N2 |

At the end of a run the furnace returns to Interval 0 which is set for boat out, 25 °C and no gas flow. The furnace waits in that state until someone aborts the current recipe or loads a new recipe.

**950°C Wet Oxide Growth, Target 6500Å**

# BRUCE FURNACE RECIPE 175 – 850°C POLY REOX

## Recipe #175




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Any | 12 min | 20 min | 5 min | 10 min | 15 min | 10 min | 10 min |
| 0 lpm | 10 lmp | 10 lpm | 5 lpm | 5 lpm | 3.6/2 lpm | 15 lpm | 10 lpm |
| none | N2 | N2 | N2 | N2 | H2/O2 | O2 | N2 |

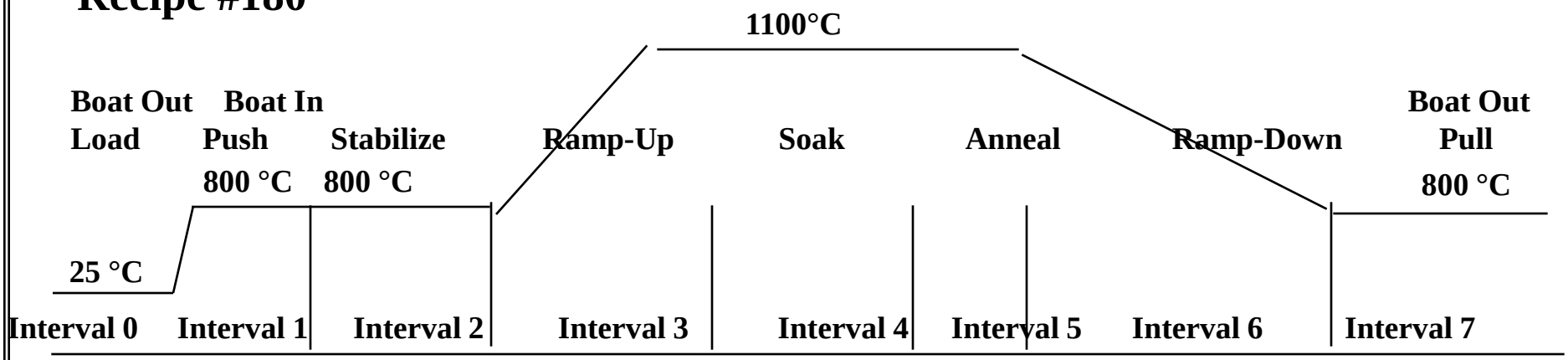
At the end of a run the furnace returns to Interval 0 which is set for boat out, 25 °C and no gas flow. The furnace waits in that state until someone aborts the current recipe or loads a new recipe.

**850°C Poly Reoxide**

# BRUCE FURNACE RECIPE 180 – P-WELL DRIVE

Verified:2-24-04

**Recipe #180**



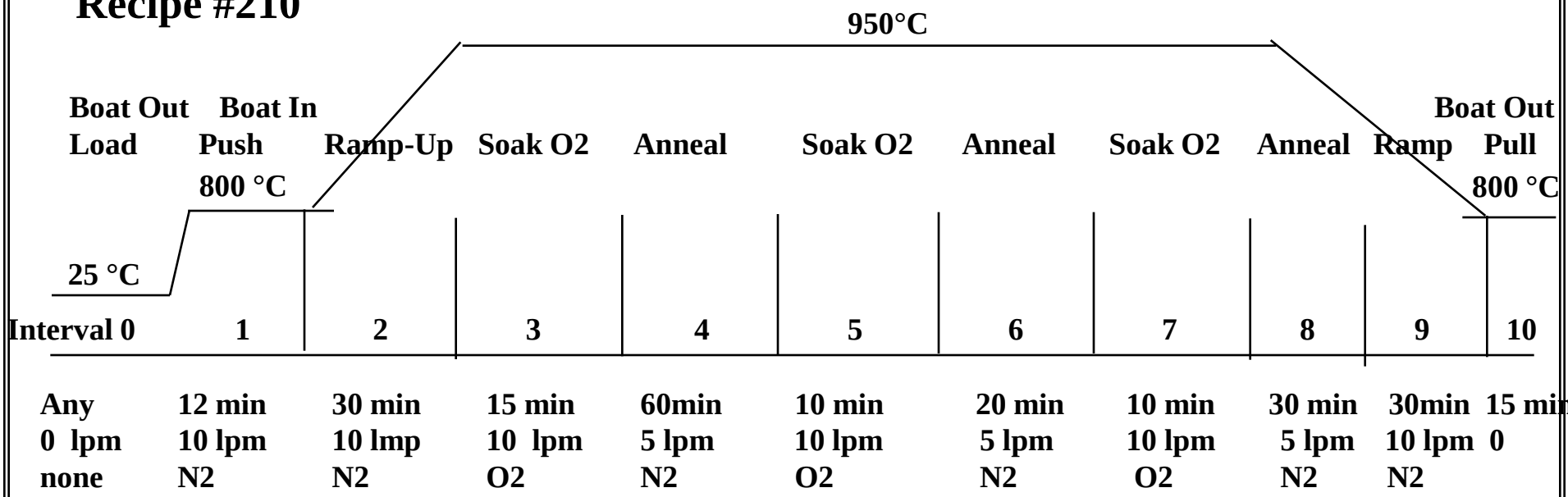

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Any | 12 min | 15 min | 30 min | 6 hr | 30 hr | 60 min | 15 min |
| 0 lpm | 10 lpm | 10 lmp | 5 lpm | 10 lpm | 15 lpm | 10 lpm | 5 lpm |
| none | N2 | N2 | O2 | O2 | N2 | N2 | N2 |

At the end of a run the furnace returns to Interval 0 which is set for boat out, 25 °C and no gas flow. The furnace waits in that state until someone aborts the current recipe or loads a new recipe.

**P-well CMOS Drive and Oxide Growth**

# BRUCE FURNACE RECIPE 210 – TUNNEL OXIDE

## Recipe #210



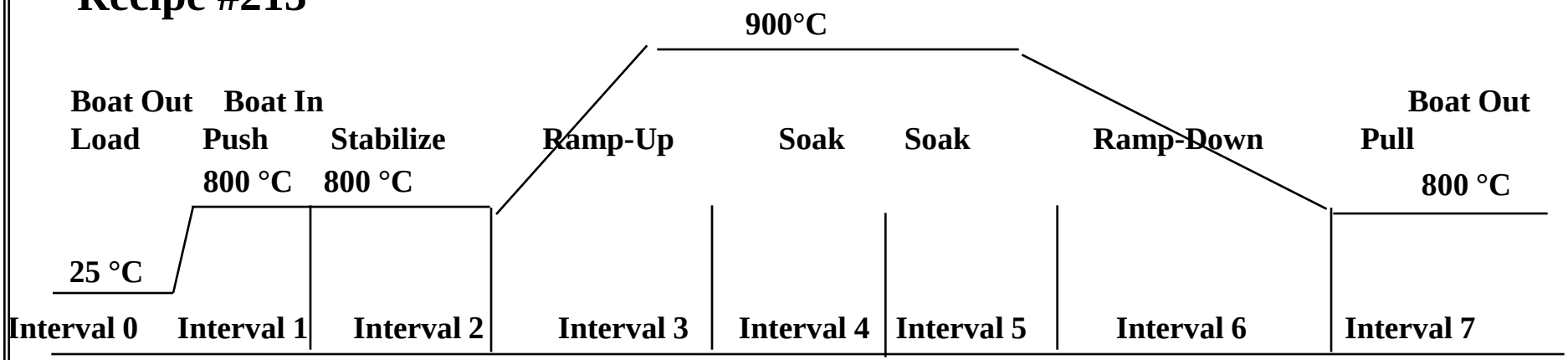

At the end of a run the furnace returns to Interval 0 which is set for boat out, 25 °C and no gas flow. The furnace waits in that state until someone aborts the current recipe or loads a new recipe.

**Tunnel Oxide for EEPROM, Target 100 Å**

# BRUCE FURNACE RECIPE 213 100 Å DRY OXIDE

Verified:2-24-04

## Recipe #213




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Any | 12 min | 30 min | 30 min | 30 min | 30 min | 30 min | 15 min |
| 0 lpm | 5 lpm | 5 lmp | 10 lpm | 10 lpm | 10 lpm | 10 lpm | 5 lpm |
| none | N2 | N2 | O2 | N2O | O2 | N2 | N2 |

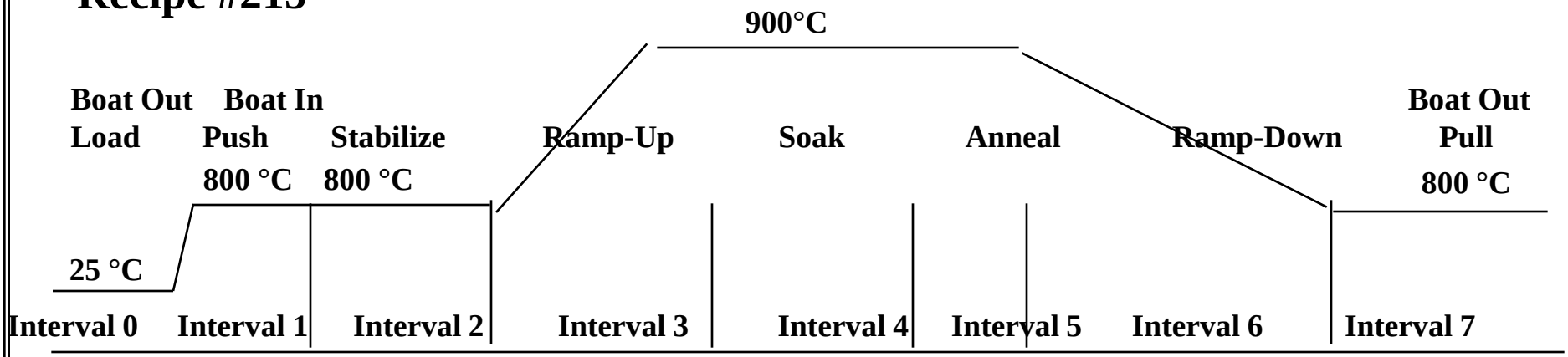
At the end of a run the furnace returns to Interval 0 which is set for boat out, 25 °C and no gas flow. The furnace waits in that state until someone aborts the current recipe or loads a new recipe.

**Dry Oxide Growth with N2O, Target 100 Å**

# BRUCE FURNACE RECIPE 215 – 150Å DRY OXIDE

Verified:2-24-04

## Recipe #215




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Any | 12 min | 15 min | 10 min | 45 min | 5 min | 20 min | 15 min |
| 0 lpm | 10 lpm | 10 lmp | 5 lpm | 10 lpm | 15 lpm | 10 lpm | 5 lpm |
| none | N2 | N2 | O2 | O2 | N2 | N2 | N2 |

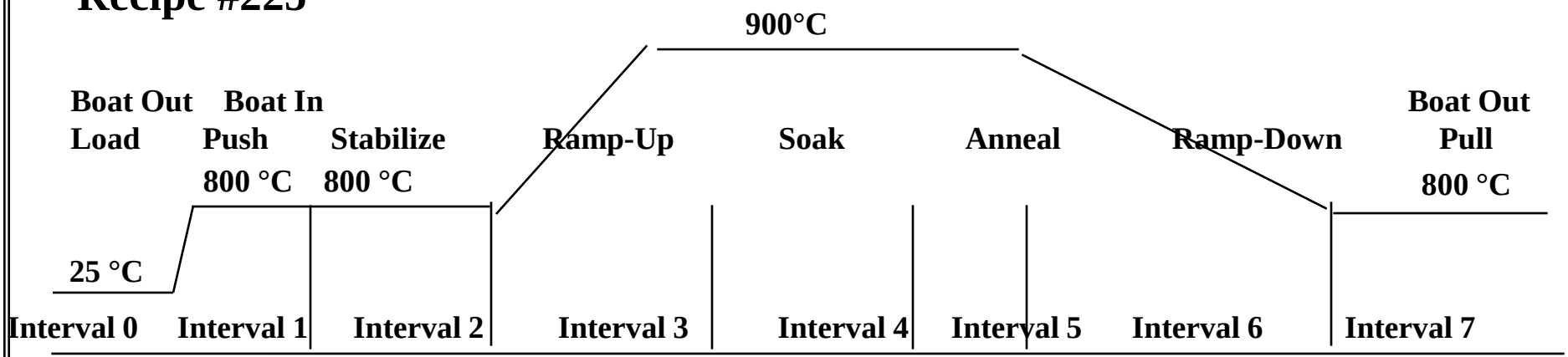
At the end of a run the furnace returns to Interval 0 which is set for boat out, 25 °C and no gas flow. The furnace waits in that state until someone aborts the current recipe or loads a new recipe.

**Dry Oxide Growth, Target 150 Å**

# BRUCE FURNACE RECIPE 225 – 250 Å DRY OXIDE

Verified:2-24-04

**Recipe #225**




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Any | 12 min | 15 min | 10 min | 93 min | 5 min | 20 min | 15 min |
| 0 lpm | 10 lpm | 10 lmp | 5 lpm | 10 lpm | 15 lpm | 10 lpm | 5 lpm |
| none | N2 | N2 | O2 | O2 | N2 | N2 | N2 |

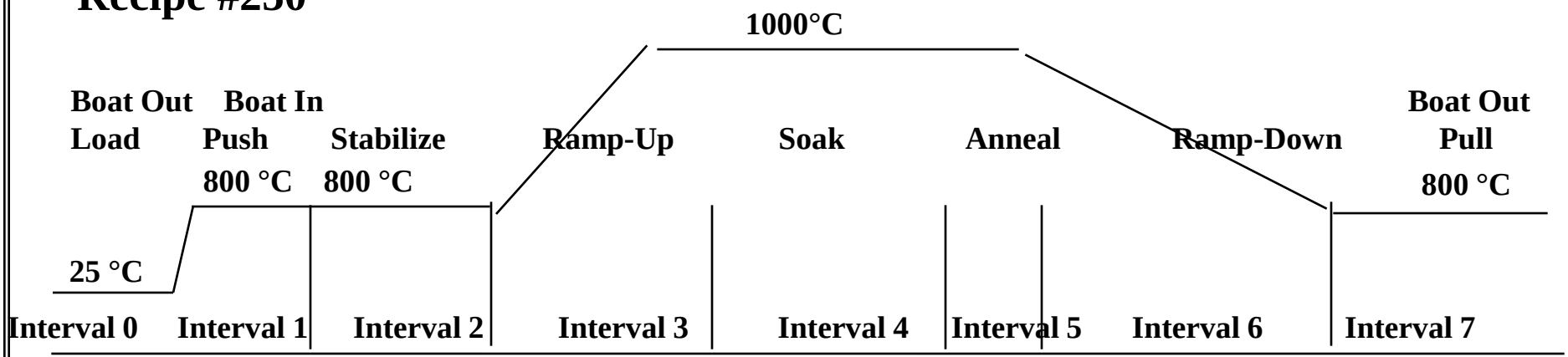
At the end of a run the furnace returns to Interval 0 which is set for boat out, 25 °C and no gas flow. The furnace waits in that state until someone aborts the current recipe or loads a new recipe.

**Dry Oxide Growth, Target 250 Å**

# BRUCE FURNACE RECIPE 250 - 500Å DRY OXIDE

Verified:2-24-04

## Recipe #250




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Any | 12 min | 15 min | 20 min | 56 min | 5min | 40 min | 12 min |
| 0 lpm | 10 lpm | 10 lpm | 5 lpm | 10 lpm | 15 lpm | 10 lpm | 5 lpm |
| none | N2 | N2 | O2 | O2 | N2 | N2 | N2 |

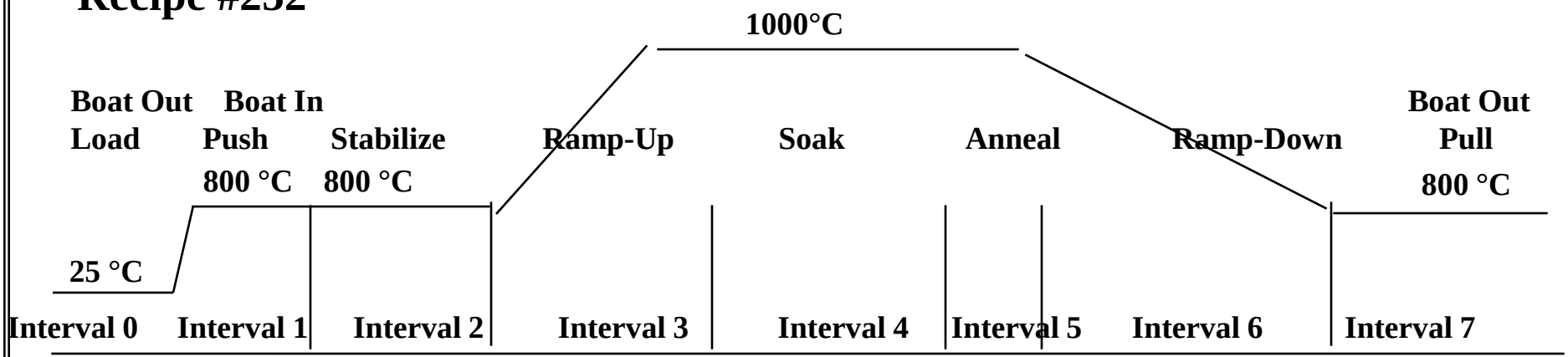
At the end of a run the furnace returns to Interval 0 which is set for boat out, 25 °C and no gas flow. The furnace waits in that state until someone aborts the current recipe or loads a new recipe.

**Dry Oxide Growth, Target 500 Å**

# BRUCE FURNACE RECIPE 252 - VARIABLE DRY OXIDE

Verified:2-24-04

## Recipe #252




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Any | 12 min | 15 min | 20 min | Variable Time | 5min | 40 min | 12 min |
| 0 lpm | 10 lpm | 10 lpm | 5 lpm | 10 lpm | 15 lpm | 10 lpm | 5 lpm |
| none | N2 | N2 | O2 | O2 | N2 | N2 | N2 |

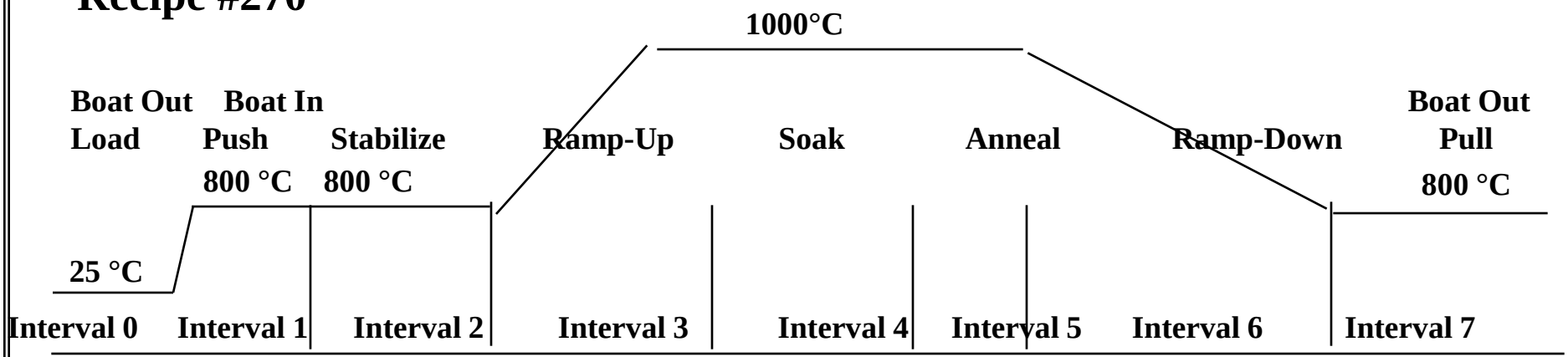
At the end of a run the furnace returns to Interval 0 which is set for boat out, 25 °C and no gas flow. The furnace waits in that state until someone aborts the current recipe or loads a new recipe.

**Dry Oxide Growth, Variable Target**

# BRUCE FURNACE RECIPE 270 – 700Å DRY OXIDE

Verified: 3-1-04

**Recipe #270**



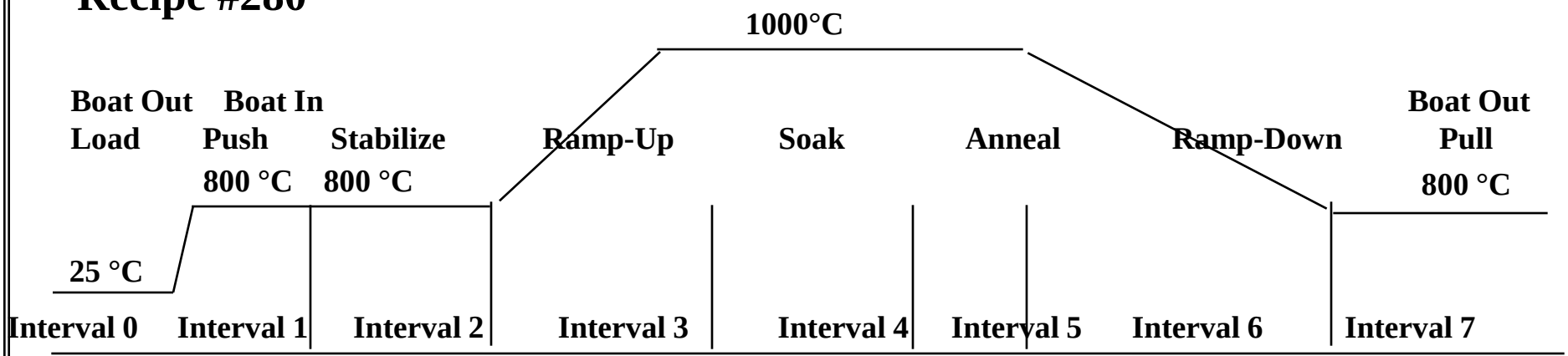

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Any | 12 min | 15 min | 20 min | 93 min | 5 min | 40 min | 15 min |
| 0 lpm | 10 lpm | 10 lmp | 5 lpm | 10 lpm | 15 lpm | 10 lpm | 5 lpm |
| none | N2 | N2 | O2 | O2/ | N2 | N2 | N2 |

At the end of a run the furnace returns to Interval 0 which is set for boat out, 25 °C and no gas flow. The furnace waits in that state until someone aborts the current recipe or loads a new recipe.

**Dry Oxide Growth, Target 700 Å**

# BRUCE FURNACE RECIPE 280 – Sub-CMOS ANNEAL

## Recipe #280



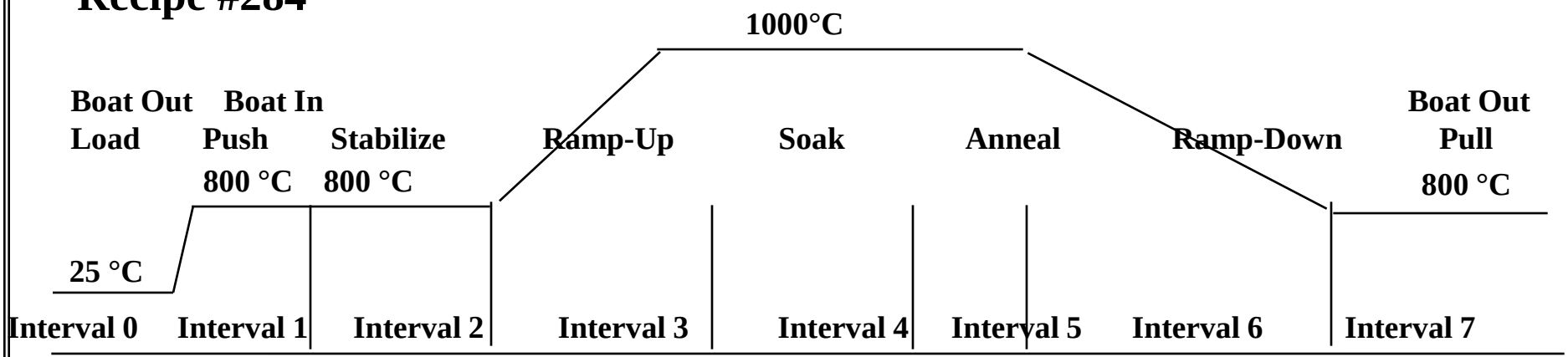

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Any | 12 min | 15 min | 20 min | 20 min | 5 min | 40 min | 15 min |
| 0 lpm | 10 lpm | 10 lmp | 5 lpm | 10 lpm | 15 lpm | 10 lpm | 5 lpm |
| none | N2 | N2 | O2 | O2/ | N2 | N2 | N2 |

At the end of a run the furnace returns to Interval 0 which is set for boat out, 25 °C and no gas flow. The furnace waits in that state until someone aborts the current recipe or loads a new recipe.

**DS Implant Anneal, Oxide Growth**

# BRUCE FURNACE RECIPE 284 – Adv-CMOS ANNEAL

## Recipe #284



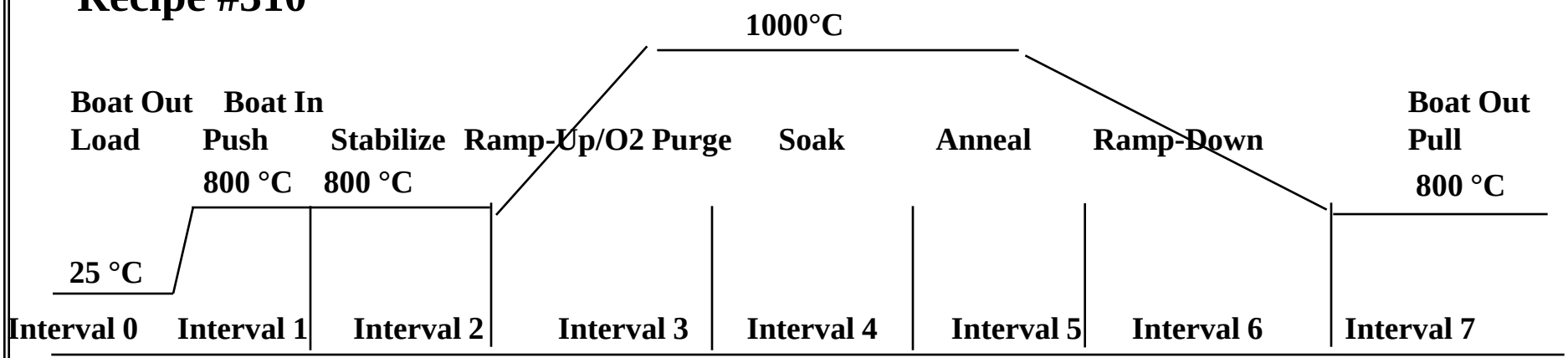

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Any | 12 min | 15 min | 20 min | 20 min | 5 min | 40 min | 15 min |
| 0 lpm | 10 lpm | 10 lmp | 5 lpm | 10 lpm | 15 lpm | 10 lpm | 5 lpm |
| none | N2 | N2 | N2 | N2 | N2 | N2 | N2 |

At the end of a run the furnace returns to Interval 0 which is set for boat out, 25 °C and no gas flow. The furnace waits in that state until someone aborts the current recipe or loads a new recipe.

**DS Implant Anneal, Oxide Growth**

# BRUCE FURNACE RECIPE 310 – DRY OXIDE 1,000Å

## Recipe #310



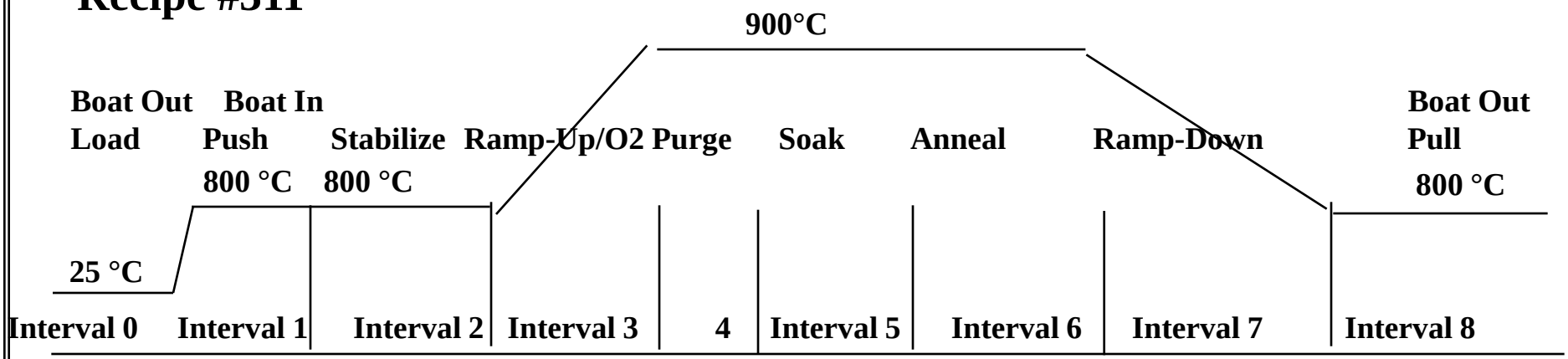

| Interval 0 | Interval 1 | Interval 2 | Interval 3 | Interval 4 | Interval 5 | Interval 6 | Interval 7 |
|---|---|---|---|---|---|---|---|
| Any | 12 min | 15 min | 20 min | 138 min | 5 min | 35 min | 15 min |
| 0 lpm | 10 lpm | 10 lmp | 5 lpm | 10 lpm | 15 lpm | 10 lpm | 5 lpm |
| none | N2 | N2 | O2 | O2 | N2 | N2 | N2 |

At the end of a run the furnace returns to Interval 0 which is set for boat out, 25 °C and no gas flow. The furnace waits in that state until someone aborts the current recipe or loads a new recipe.

**Dry Oxide Growth, Target 1000 Å**

# BRUCE FURNACE RECIPE 311 – WET OXIDE 1,000Å

## Recipe #311



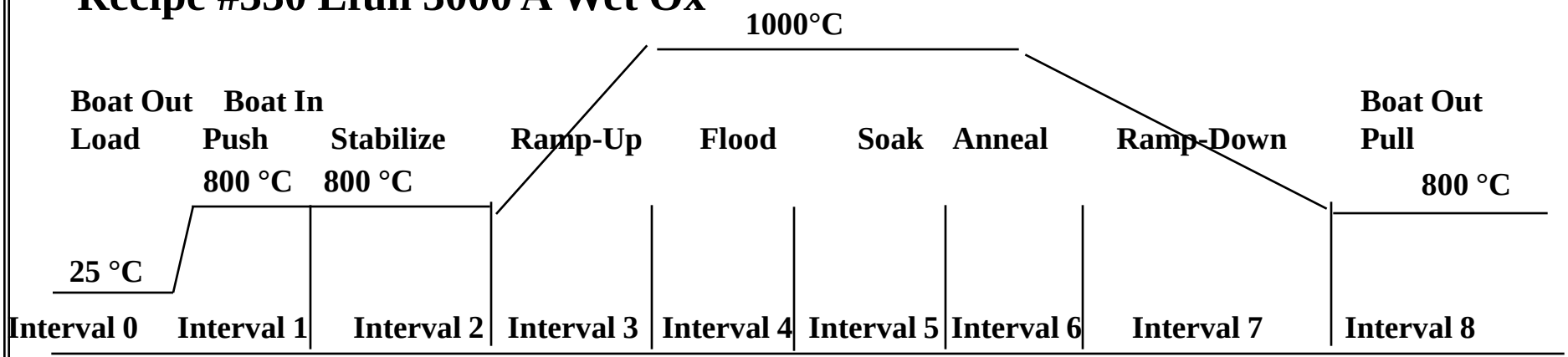

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Any | 12 min | 15 min | 10 min | 5 min | 40 min | 5 min | 15 min | 15 min |
| 0 lpm | 10 lpm | 10 lmp | 5 lpm | 10 lpm | 3.6/2.0 lpm | 15 lpm | 10 lpm | 5 lpm |
| none | N2 | N2 | O2 | O2 | O2/H2 | N2 | N2 | N2 |

At the end of a run the furnace returns to Interval 0 which is set for boat out, 25 °C and no gas flow. The furnace waits in that state until someone aborts the current recipe or loads a new recipe.

**Wet Oxide Growth, Target 1000 Å, Kooi**

# BRUCE FURNACE RECIPE 330 – WET OXIDE 3,000Å

## Recipe #330 Lfull 3000 A Wet Ox



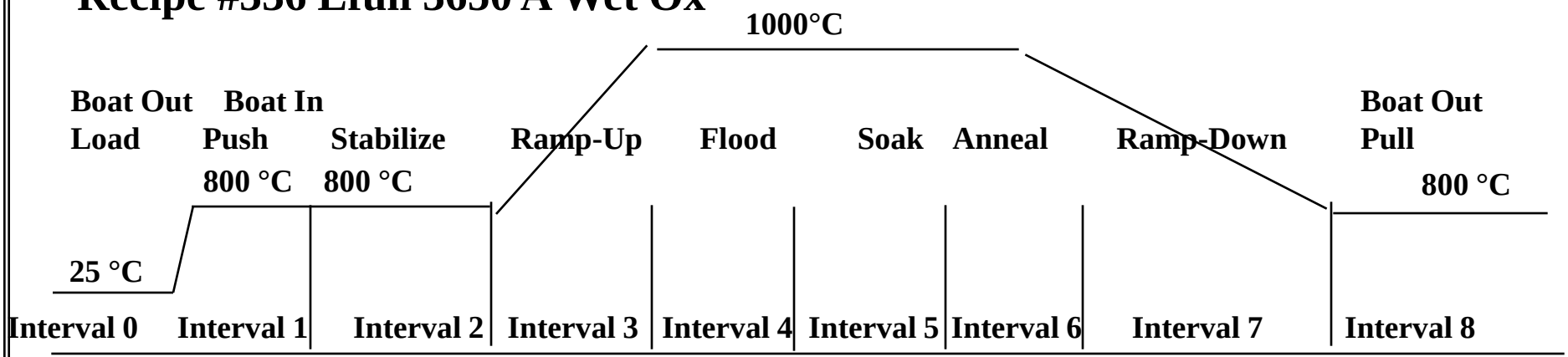

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Any | 12 min | 15 min | 20 min | 5 min | 50 min | 5 min | 40 min | 12 min |
| 0 lpm | 10 lpm | 10 lpm | 5 lpm | 10 lpm | 3.6/2.0 lpm | 15 lpm | 10 lpm | 5 lpm |
| none | N2 | N2 | N2 | O2 | O2/H2 | N2 | N2 | N2 |

At the end of a run the furnace returns to Interval 0 which is set for boat out, 25 °C and no gas flow. The furnace waits in that state until someone aborts the current recipe or loads a new recipe.

**Wet Oxide Growth, Target 3000 Å**

# BRUCE FURNACE RECIPE 336 – WET OXIDE 3,650Å

## Recipe #336 Lfull 3650 A Wet Ox



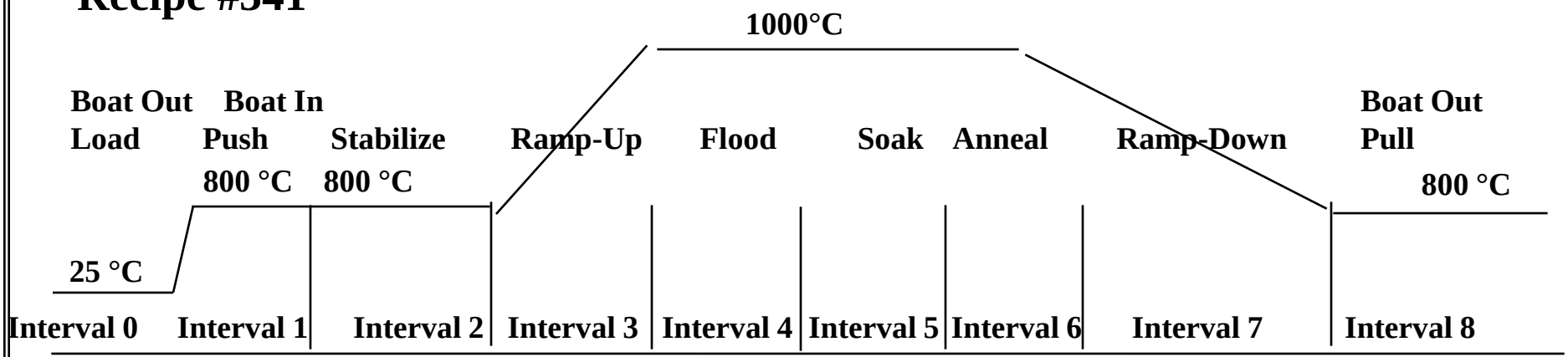

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Any | 12 min | 15 min | 20 min | 5 min | 55 min | 5 min | 40 min | 12 min |
| 0 lpm | 10 lpm | 10 lpm | 5 lpm | 10 lpm | 3.6/2.0 lpm | 15 lpm | 10 lpm | 5 lpm |
| none | N2 | N2 | N2 | O2 | O2/H2 | N2 | N2 | N2 |

At the end of a run the furnace returns to Interval 0 which is set for boat out, 25 °C and no gas flow. The furnace waits in that state until someone aborts the current recipe or loads a new recipe.

**Wet Oxide Growth, Target 3650 Å**

# BRUCE FURNACE RECIPE 341 – WET OXIDE 4,000Å

## Recipe #341



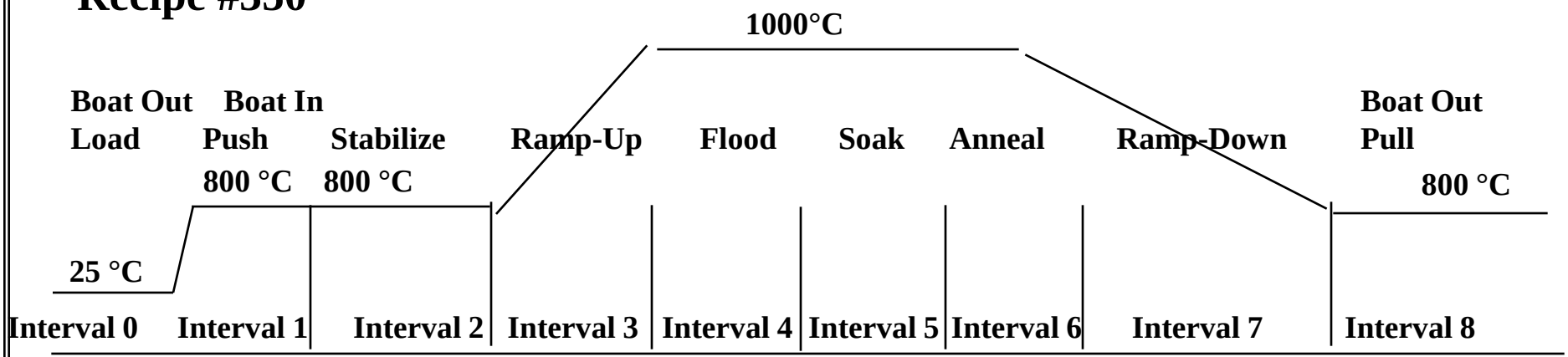

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Any | 12 min | 15 min | 20 min | 5 min | 20 min | 5 min | 40 min | 12 min |
| 0 lpm | 10 lpm | 10 lpm | 5 lpm | 10 lpm | 3.6/2.0 lpm | 15 lpm | 10 lpm | 5 lpm |
| none | N2 | N2 | N2 | O2 | O2/H2 | N2 | N2 | N2 |

At the end of a run the furnace returns to Interval 0 which is set for boat out, 25 °C and no gas flow. The furnace waits in that state until someone aborts the current recipe or loads a new recipe.

**Wet Oxide Growth, Target 4000 Å**

# BRUCE FURNACE RECIPE 350 – WET OXIDE 5,000Å

## Recipe #350



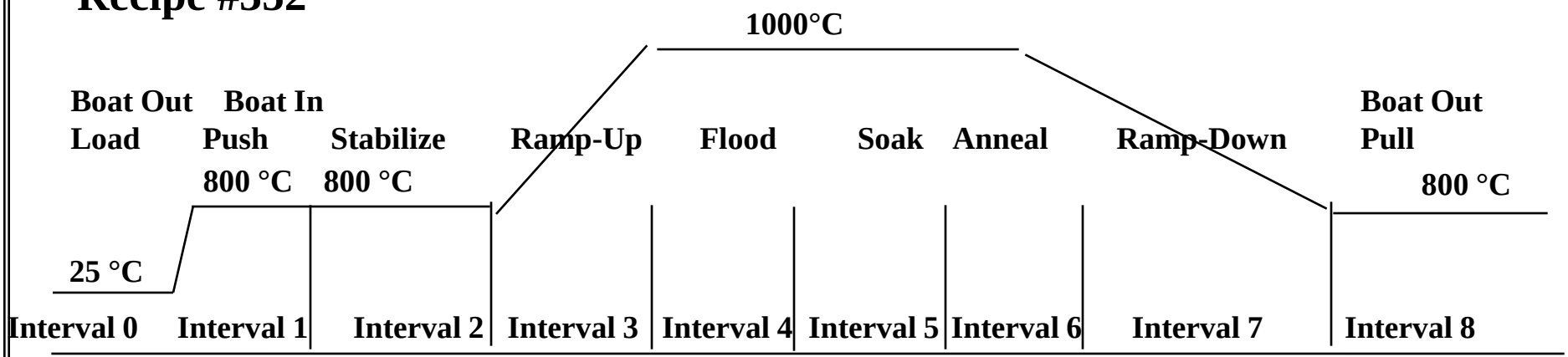

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Any | 12 min | 15 min | 20 min | 5 min | 100 min | 5 min | 40 min | 12 min |
| 0 lpm | 10 lpm | 10 lpm | 5 lpm | 10 lpm | 3.6/2.0 lpm | 15 lpm | 10 lpm | 5 lpm |
| none | N2 | N2 | N2 | O2 | O2/H2 | N2 | N2 | N2 |

At the end of a run the furnace returns to Interval 0 which is set for boat out, 25 °C and no gas flow. The furnace waits in that state until someone aborts the current recipe or loads a new recipe.

**Wet Oxide Growth, Target 5000 Å**

# BRUCE FURNACE RECIPE 352 – WET OXIDE VARIABLE THICKNESS

## Recipe #352



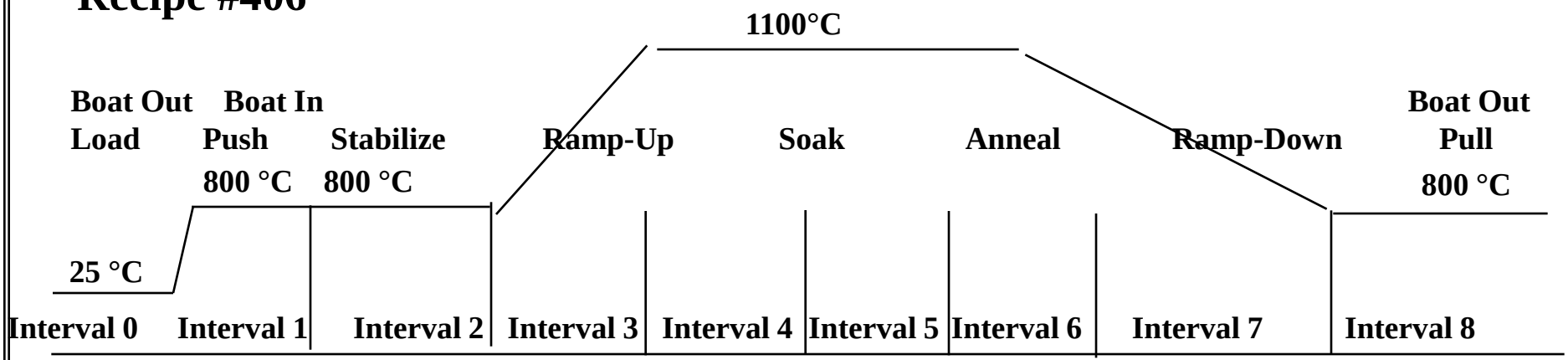

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Any | 12 min | 15 min | 20 min | 5 min | ??? min | 5 min | 40 min | 12 min |
| 0 lpm | 10 lpm | 10 lpm | 5 lpm | 5 lpm | 10 lpm | 15 lpm | 10 lpm | 15 lpm |
| none | N2 | N2 | N2 | O2 | O2/H2 | N2 | N2 | N2 |

At the end of a run the furnace returns to Interval 0 which is set for boat out, 25 °C and no gas flow. The furnace waits in that state until someone aborts the current recipe or loads a new recipe.

**Wet Oxide Growth, Variable Target**

# BRUCE FURNACE RECIPE 406 – WET OXIDE 6,500Å

## Recipe #406



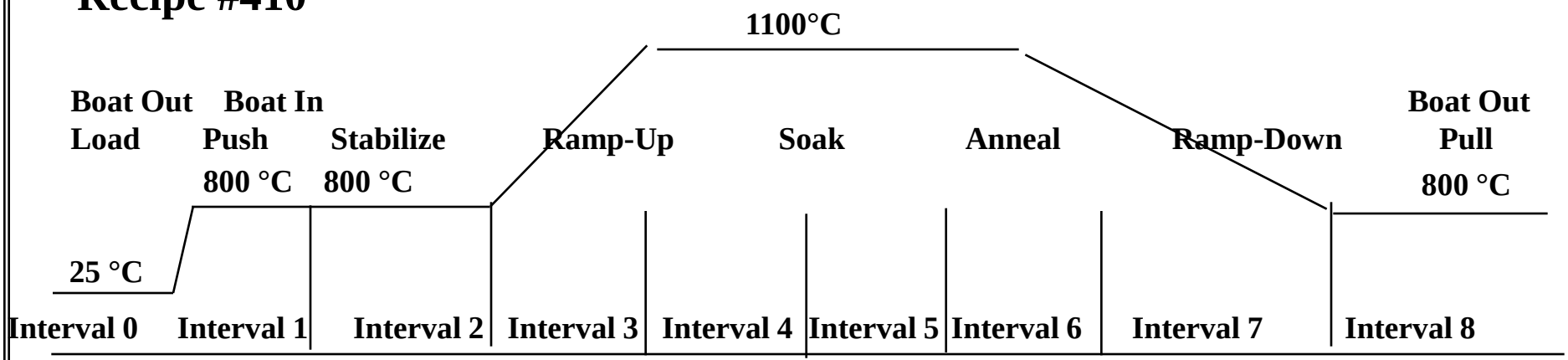

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Any | 12 min | 15 min | 30 min | 5 min | 65 min | 5 min | 60 min | 12 min |
| 0 lpm | 10 lpm | 10 lpm | 5 lpm | 5 lpm | 10 lpm | 15 lpm | 10 lpm | 15 lpm |
| none | N2 | N2 | N2 | O2 | O2/H2 | N2 | N2 | N2 |

At the end of a run the furnace returns to Interval 0 which is set for boat out, 25 °C and no gas flow. The furnace waits in that state until someone aborts the current recipe or loads a new recipe.

**Wet Oxide Growth, Target 6,500 Å**

# BRUCE FURNACE RECIPE 410 – WET OXIDE 12,000Å

## Recipe #410



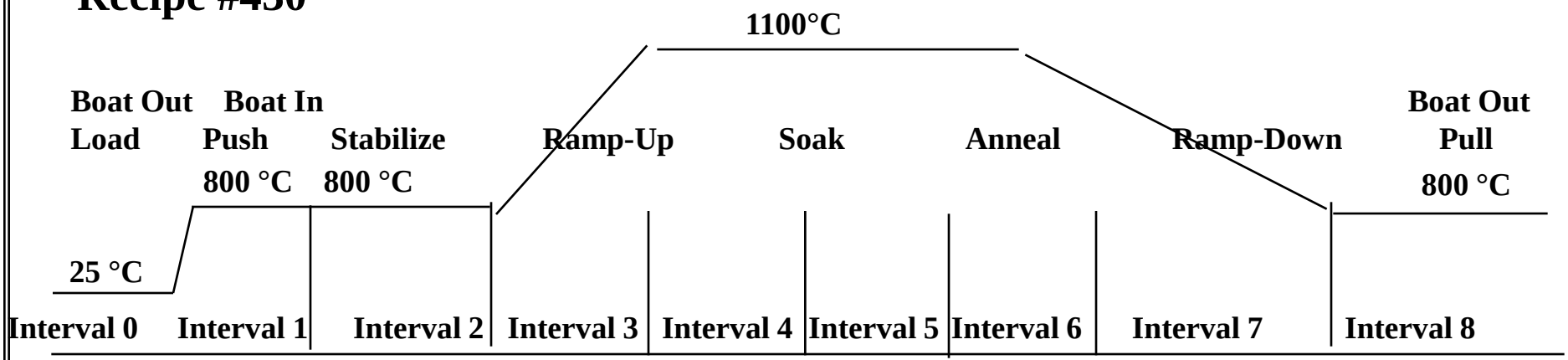

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Any | 12 min | 15 min | 30 min | 5 min | 210 min | 5 min | 60 min | 12 min |
| 0 lpm | 10 lpm | 10 lpm | 5 lpm | 5 lpm | 10 lpm | 15 lpm | 10 lpm | 15 lpm |
| none | N2 | N2 | N2 | O2 | O2/H2 | N2 | N2 | N2 |

At the end of a run the furnace returns to Interval 0 which is set for boat out, 25 °C and no gas flow. The furnace waits in that state until someone aborts the current recipe or loads a new recipe.

**Wet Oxide Growth, Target 12,000 Å**

# BRUCE FURNACE RECIPE 430 – WET OXIDE 30,000Å

## Recipe #430



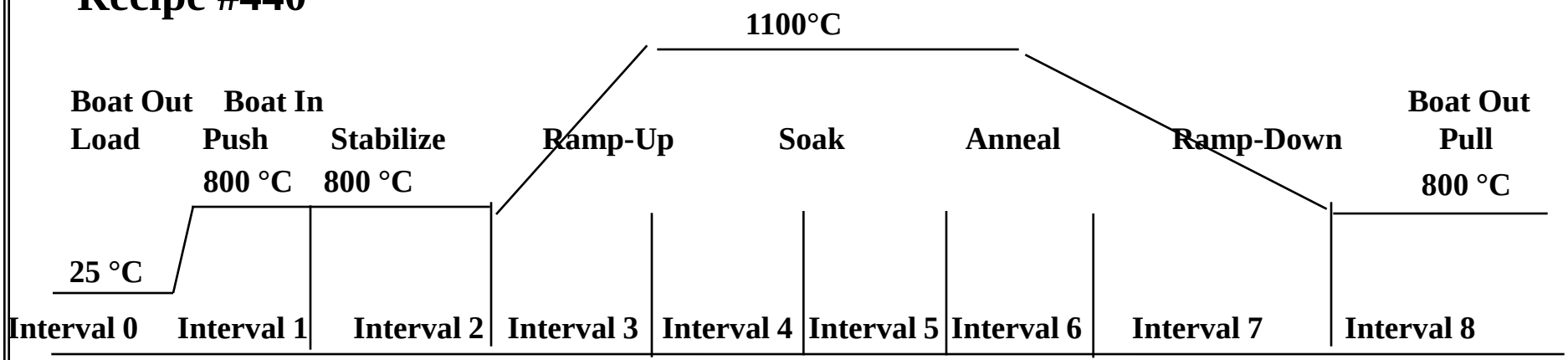

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Any | 12 min | 15 min | 30 min | 5 min | 15 hrs | 5 min | 60 min | 12 min |
| 0 lpm | 10 lpm | 10 lpm | 5 lpm | 5 lpm | 10 lpm | 15 lpm | 10 lpm | 15 lpm |
| none | N2 | N2 | N2 | O2 | O2/H2 | N2 | N2 | N2 |

At the end of a run the furnace returns to Interval 0 which is set for boat out, 25 °C and no gas flow. The furnace waits in that state until someone aborts the current recipe or loads a new recipe.

**Wet Oxide Growth, Target 30,000 Å**

# BRUCE FURNACE RECIPE 440 – WET OXIDE 40,000Å

## Recipe #440



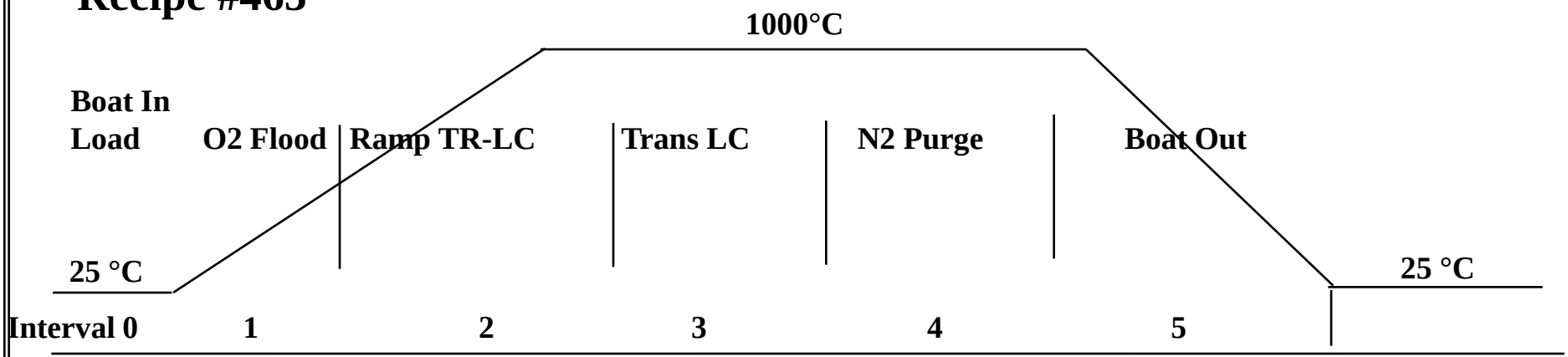

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Any | 12 min | 15 min | 30 min | 5 min | 35 hrs | 5 min | 60 min | 12 min |
| 0 lpm | 10 lpm | 10 lpm | 5 lpm | 10 lpm | 3.6/2.0 lpm | 15 lpm | 10 lpm | 5 lpm |
| none | N2 | N2 | N2 | O2 | O2/H2 | N2 | N2 | N2 |

At the end of a run the furnace returns to Interval 0 which is set for boat out, 25 °C and no gas flow. The furnace waits in that state until someone aborts the current recipe or loads a new recipe.

**Wet Oxide Growth, Target 40,000 Å**

# BRUCE FURNACE RECIPE 463 – TransLC CLEAN

## Recipe #463



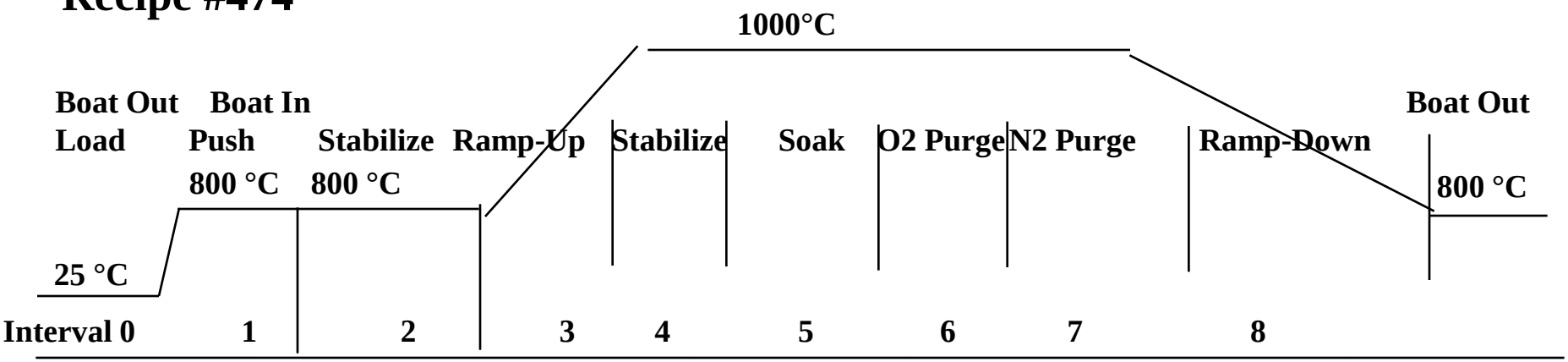

| | | | | | |
|---|---|---|---|---|---|
| Any | 5 min | 20 min | 20 min | 20 min | 0 min |
| 0 lpm | 10 lpm | 11.5 lpm O2 | | 5 lpm | 5 lpm |
| none | O2 | 0.9 lpm O2 and 445 FL | | N2 | N2 |

At the end of a run the furnace returns to Interval 0 which is set for boat out, 25 °C and no gas flow. The furnace waits in that state until someone aborts the current recipe or loads a new recipe.

**1000 °C Trans LC Tube Clean, Tube 4**

# BRUCE FURNACE RECIPE 474 – GATE OXIDE 310Å

## Recipe #474




| Any | 12 min | 20 min | 20 min | 5 min | 9.5 MIN | 5 min | 5 min | 35 min |
|---|---|---|---|---|---|---|---|---|
| 0 lpm | 10 lpm | 10 lpm | 5 lpm | 5 lpm | 10 lpm | 10 lpm | 15 lpm | 10 lpm |
| none | O2 | O2 | O2 | O2 | O2+TransLC | O2 N2 | N2 | |

At the end of a run the furnace returns to Interval 0 which is set for boat out, 25 °C and no gas flow. The furnace waits in that state until someone aborts the current recipe or loads a new recipe.

**1000°C 310Å Gate Oxide Growth**

# *REFERENCES*

1. Sdfklj
2. slfj