RotoCycle™
Rotational Molding Machine Cycle Simulator Software

Software User Guide

May-2022

Contents

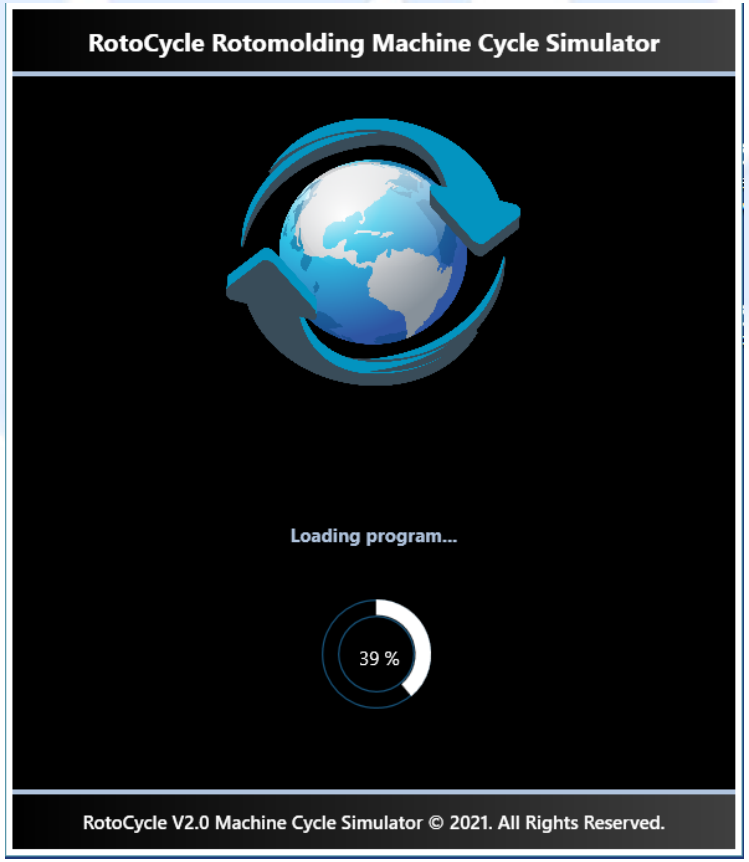
- RotoCycle Machine Cycle Simulation Software – Overview
- Installation & Obtaining a License Number
- Step-by-Step Guide to Running a Simulation
- Sample Output
- Examples & Analysis
  - Out of Balance Cycles
  - Comparing Output Rates for Different Styles of Machines
  - Mold Servicing Times – Analyse Productivity

RotoCycle Machine Cycle Simulation Software

- RotoCycle is an easy-to-use, powerful simulation tool which enables users to calculate the output of a range of common rotational molding machine styles based on operating parameters provided by the user
- As an analysis and teaching tool, RotoCycle can:
  - Estimate ideal machine output – useful for production management targets
  - Help optimize machine settings prior to operation
  - Examine the effect of out-of-balance scenarios such as long cooling or demolding cycles on multi-arm production units
  - Provide reports on where delays can be expected for a given cycle setup
  - Compare the output rates of different machines for ideal machine selection

Installation & Obtaining a License Number

Installation & Obtaining a License Number



1. Download the Demo software via the zip file located at https://www.ferryindustries.com/RotoSpeed/RotoCycle

2. Extract the files to a file location on your hard drive. Install the software. Follow the instructions on the following pages.

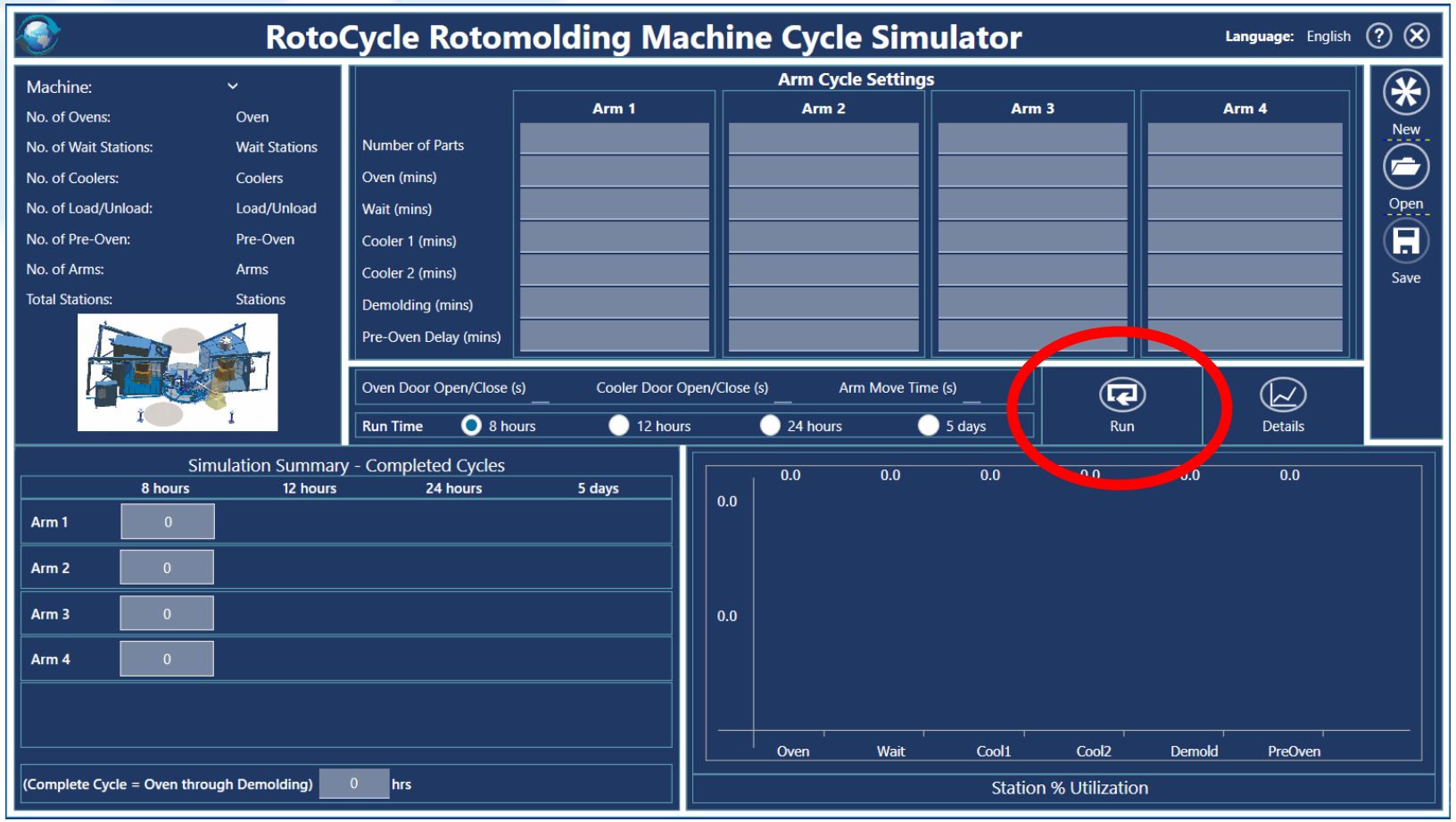
3. Click on the RotoCycle icon or Rotocycle.UI.exe file in the RotoCycle directory.

4. The program will start to initialize and show the screen to the left.

Please note: A unique software license will be created for a single, specific computer. Each installation on each computer will need its own unique license file. Pricing is based on each unique installation and license file supplied.

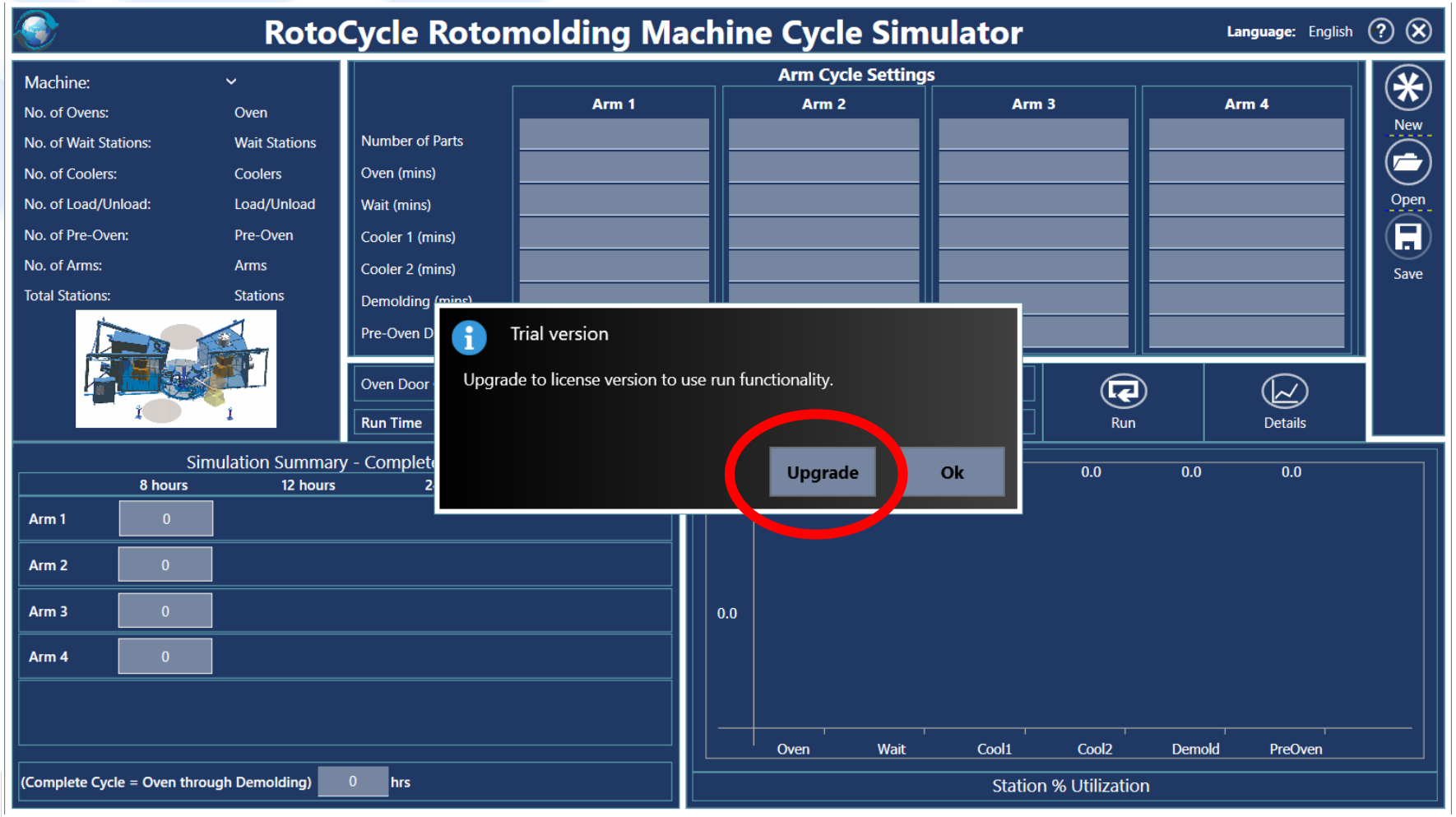
Installation & Obtaining a License Number

Once the program has loaded, the main RotoCycle screen will appear (see below), click on the ‘Run’ button for the upgrade activation steps.



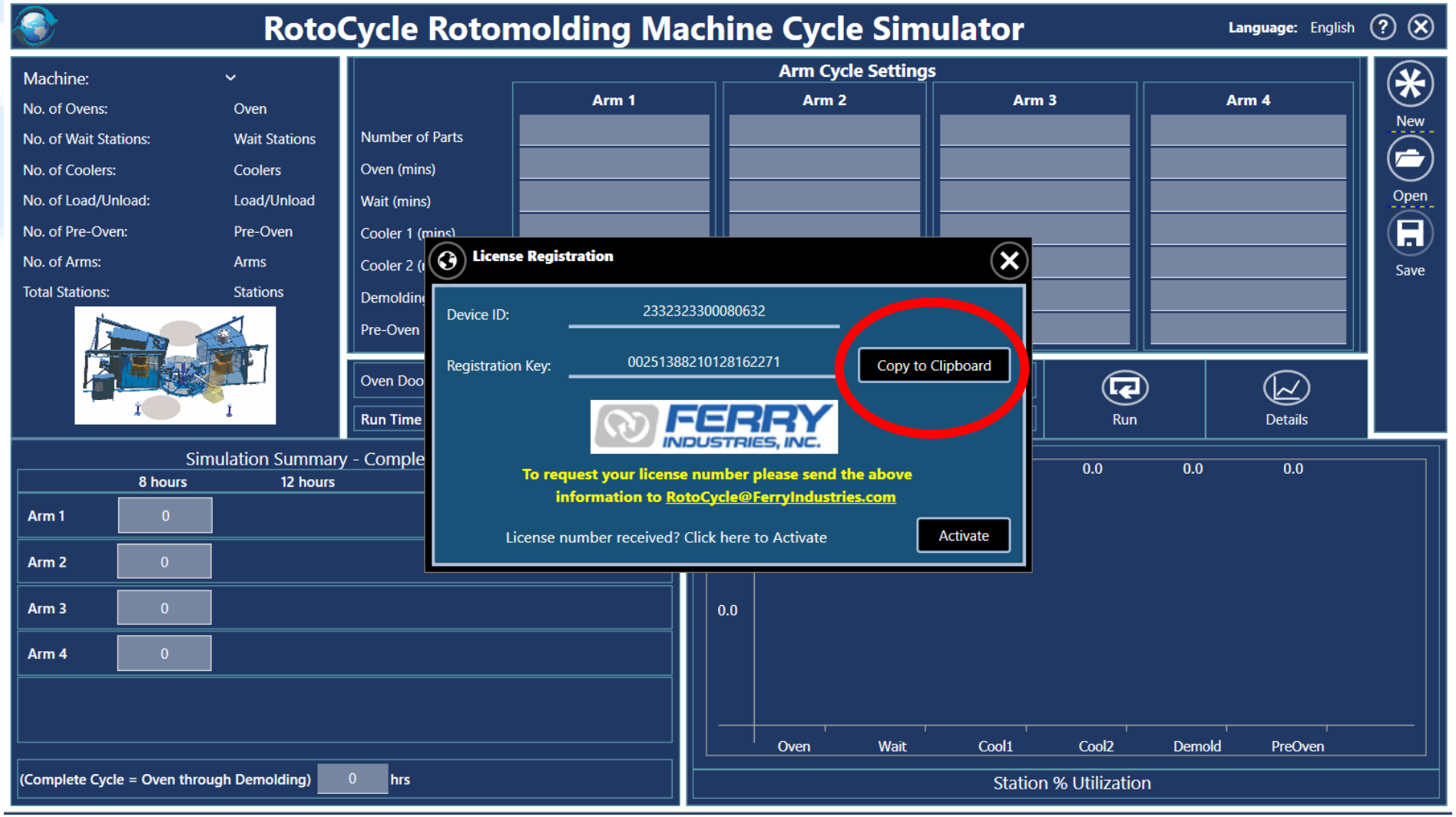
Installation & Obtaining a License Number

Click on the ‘Upgrade’ button to access you the Device ID and Registration ID codes.
Clicking ‘Ok’ closes the dialog box.



Installation & Obtaining a License Number

Click on the ‘Copy to Clipboard’ button.



Installation & Obtaining a License Number

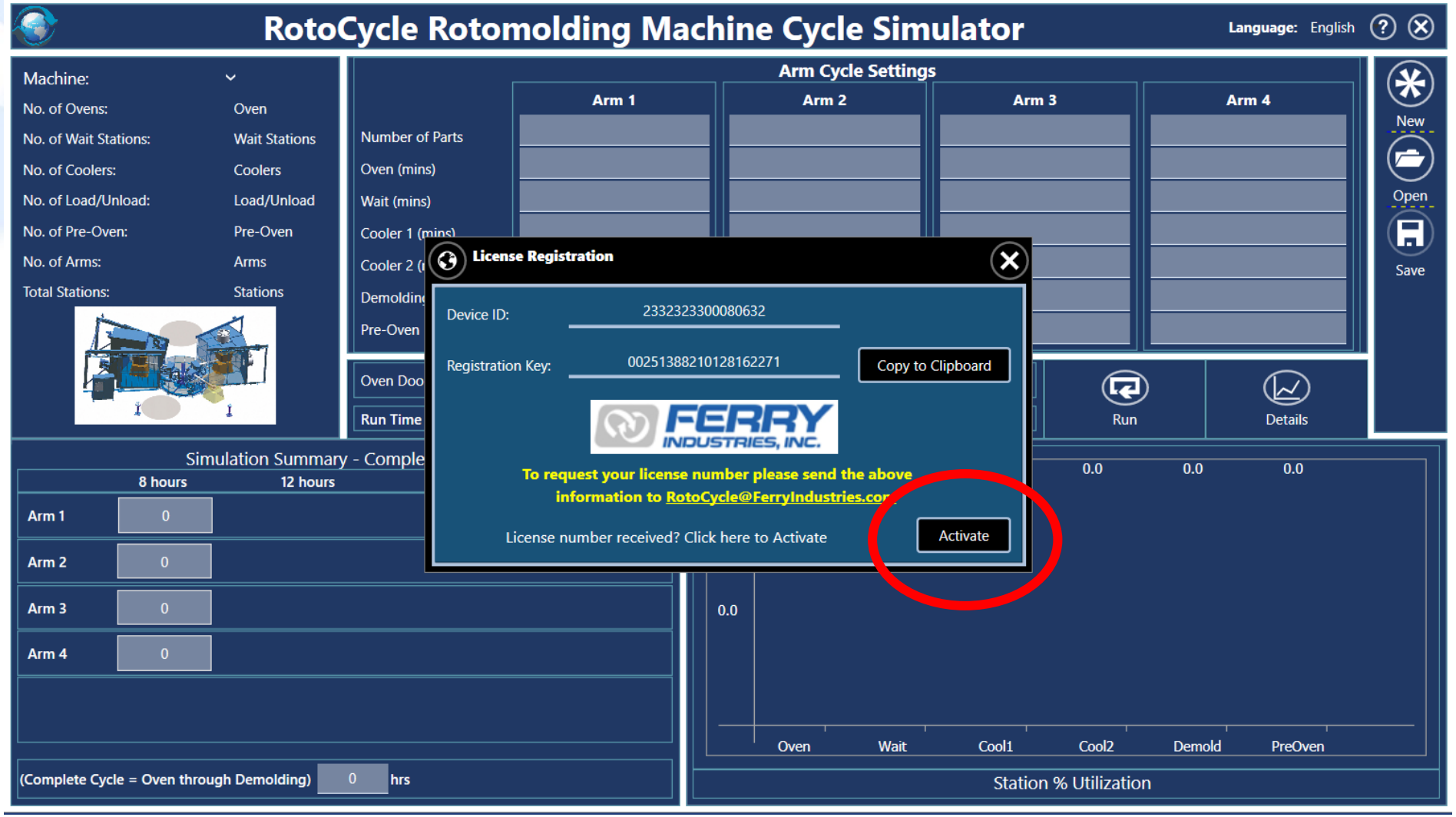
Send an email to RotoCycle@ferryindustries.com and paste the clipboard copied Device ID and Registration ID in the body of the email. Include your contact details and company information.

Once Ferry receives your email, a sales representative will contact you in a few days regarding pricing, invoice and payment process.

Once customer payment is complete by credit card through our website, Ferry will provide the license code to the customer to activate the software.

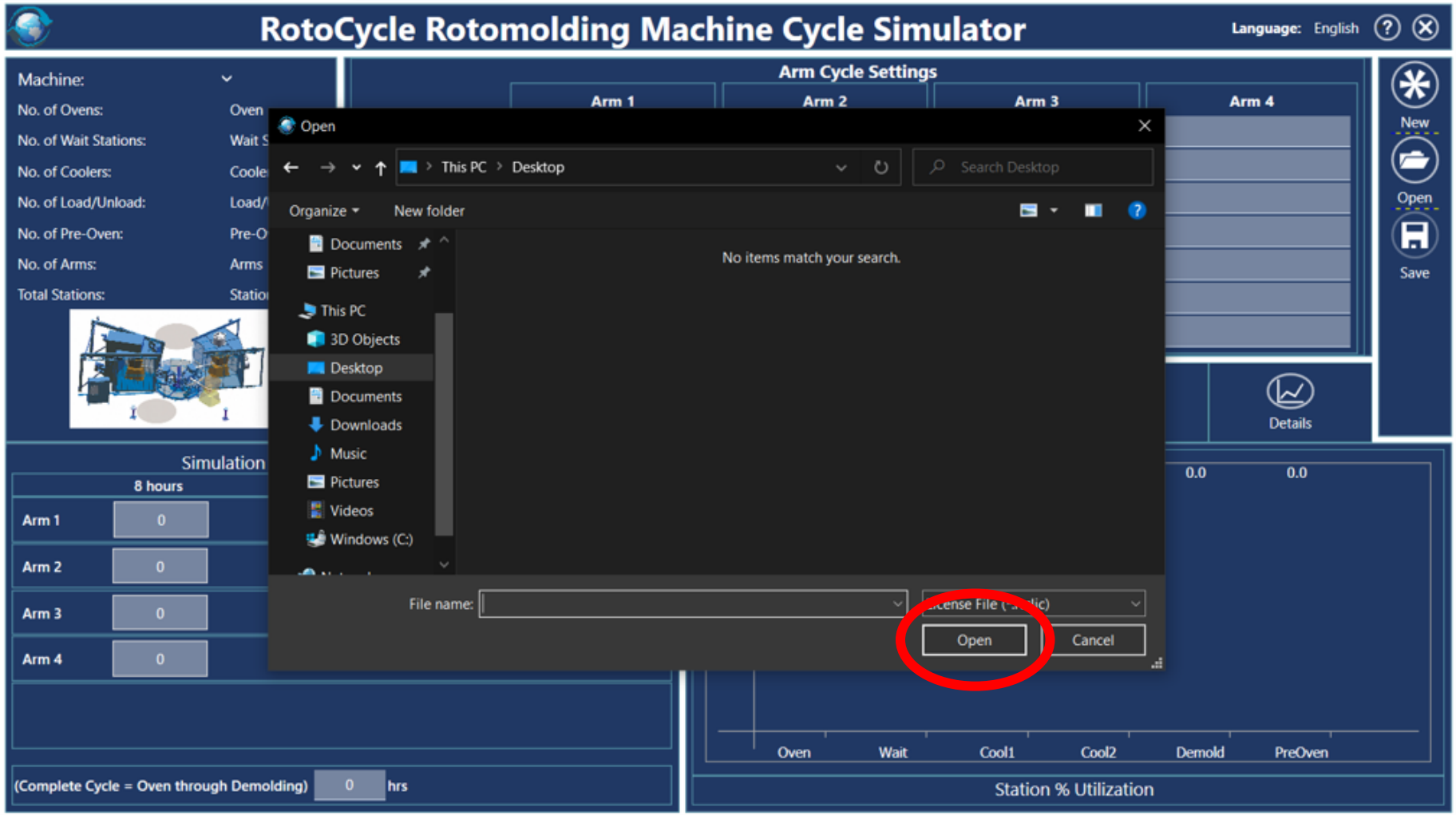
Installation & Obtaining a License Number

Once you receive a license file (<YourCompany>.rtclic), place it on the desktop or any suitable directory. Click on ‘Activate’ button.



Installation & Obtaining a License Number

Then locate the license file and click ‘Open’
RotoCycle is now ready to use

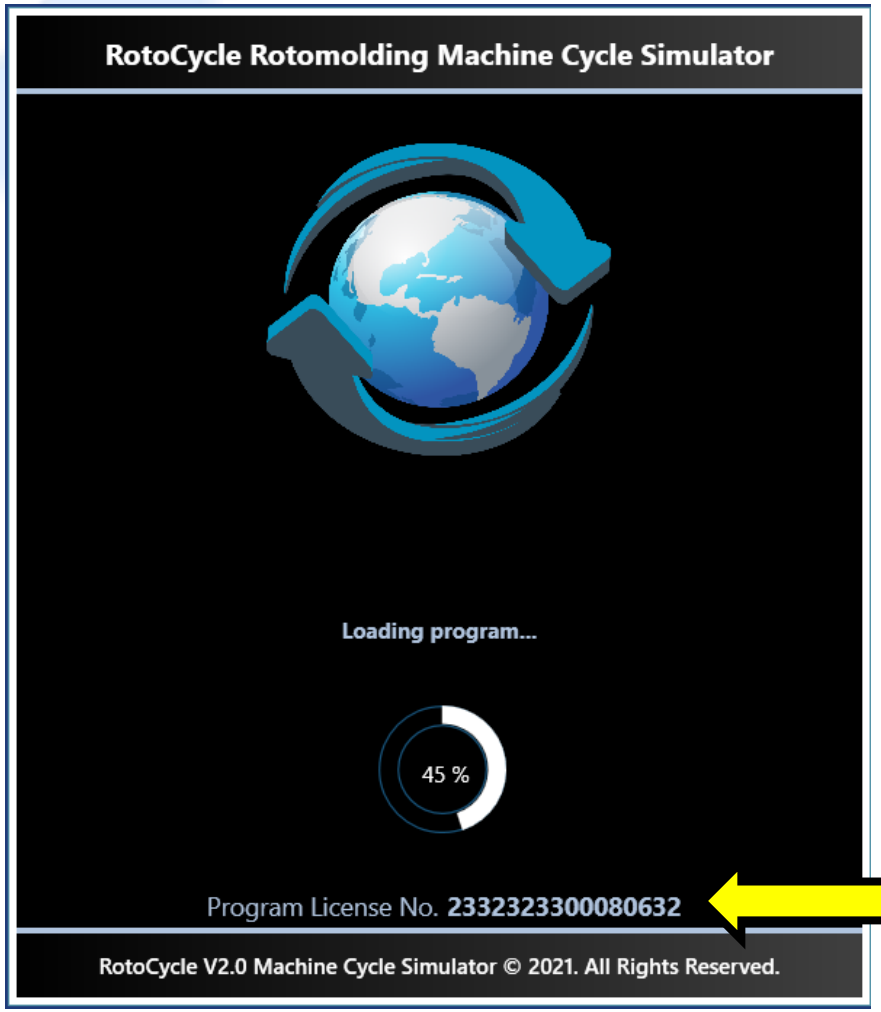


RotoCycle™ Rotational Molding Machine Cycle Simulator Software

FERRY INDUSTRIES, INC.

Installation & Obtaining a License Number

On reopening RotoCycle, the license number will be now be displayed on the initial window
The license file is maintained in the main RotoCycle directory on the computer.

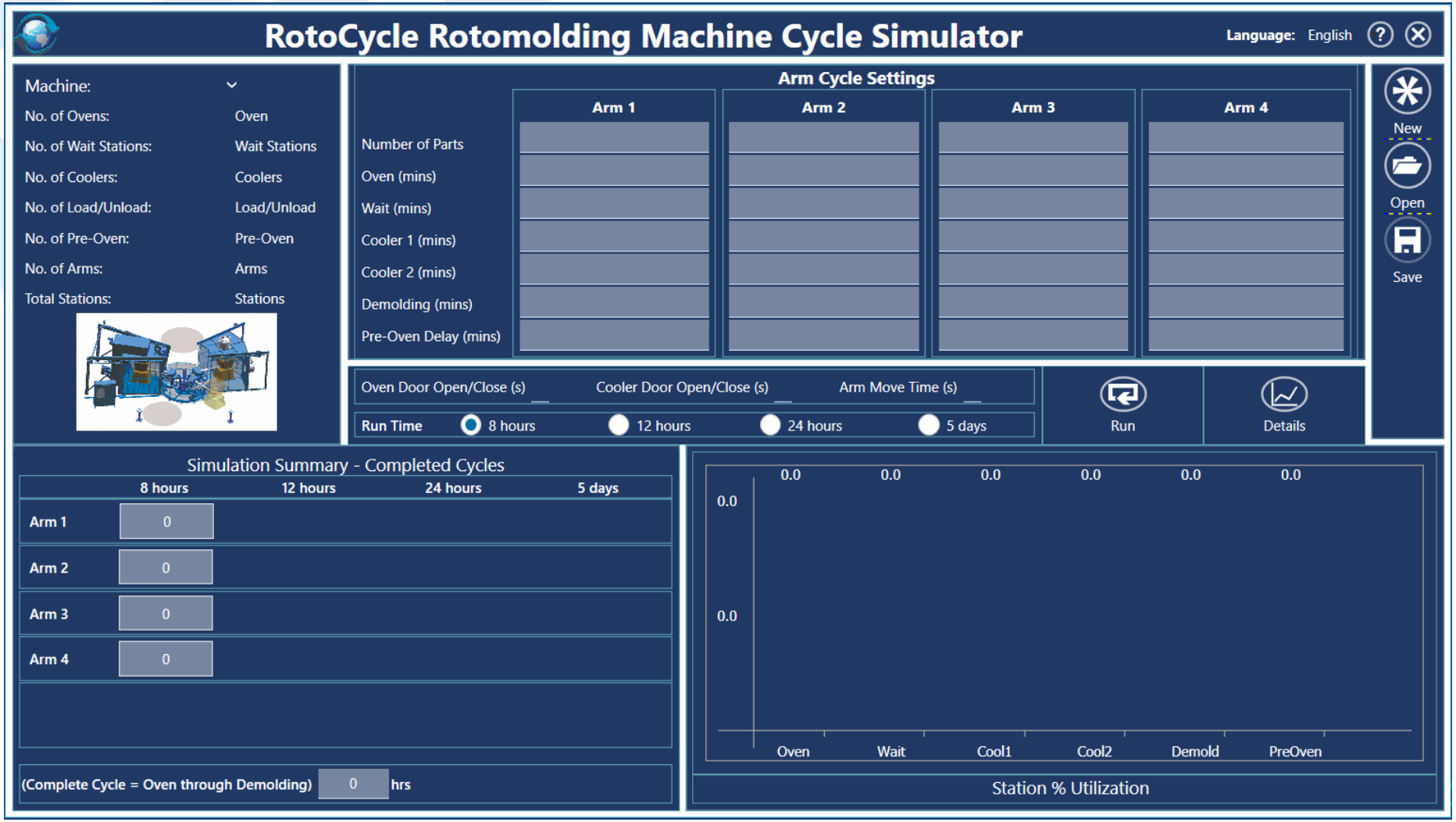


Program License Number

Step-by-Step Guide to Running a RotoCycle Simulation

Step-by-Step Guide to Running a Simulation

Open RotoCycle and wait for the main screen to appear as shown below.

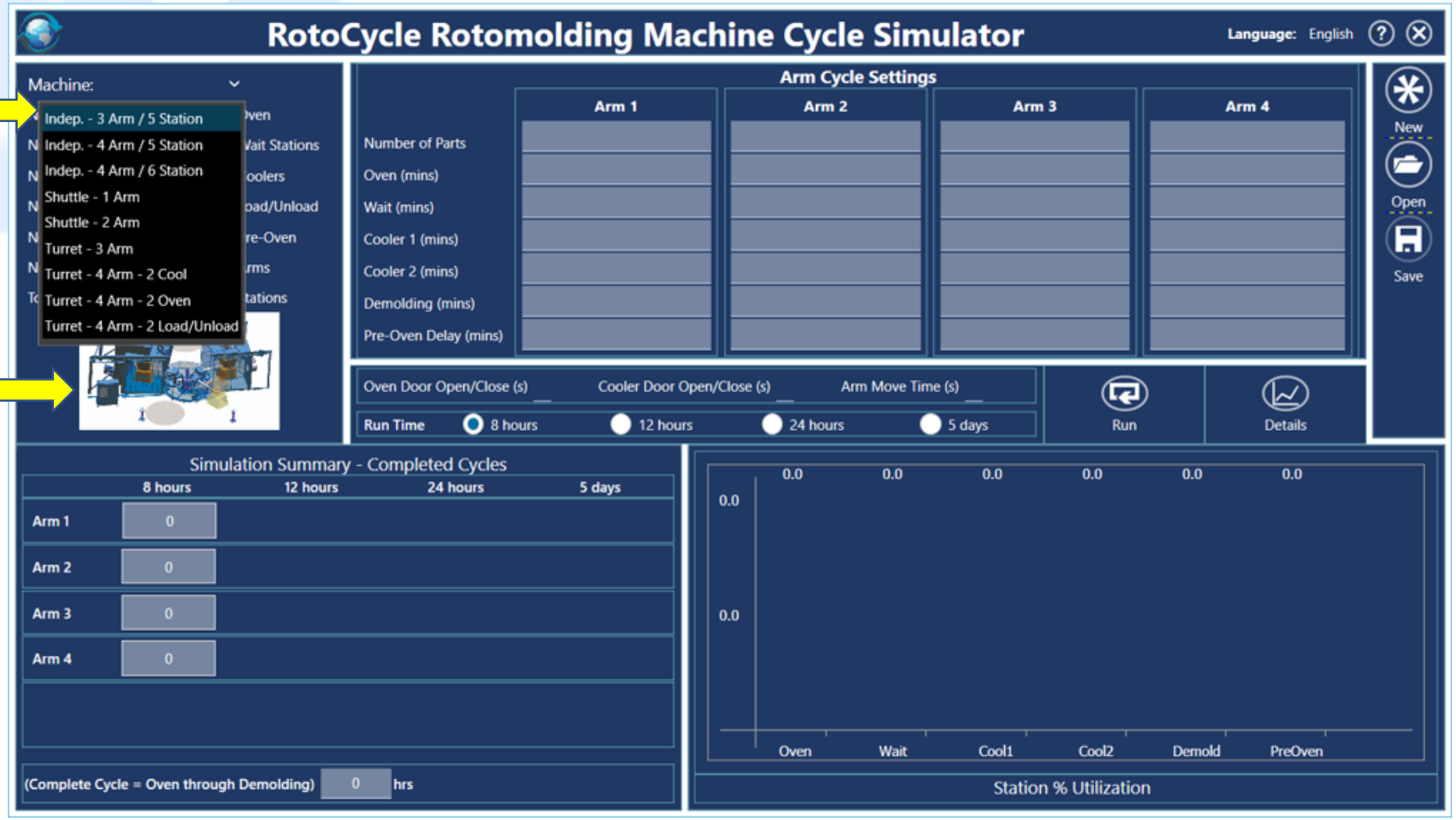


Step-by-Step Guide to Running a Simulation

Step 1. Select a **Machine Style** for the simulation

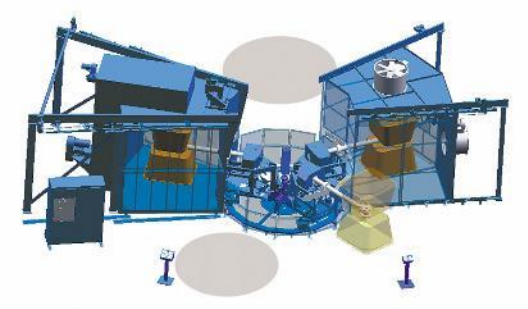
Machine Selector Window Drop-down

Machine Configuration

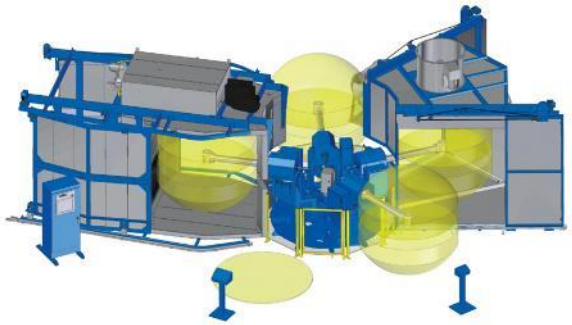


Step-by-Step Guide to Running a Simulation

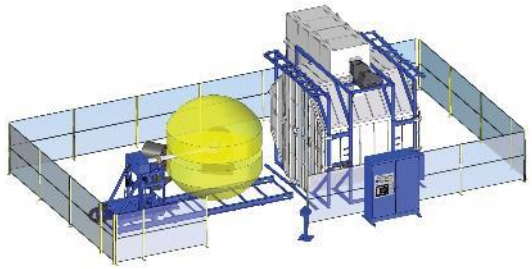
Available **Machine Styles to choose from** (Independent 4-Arm, 6-Station configuration not shown)



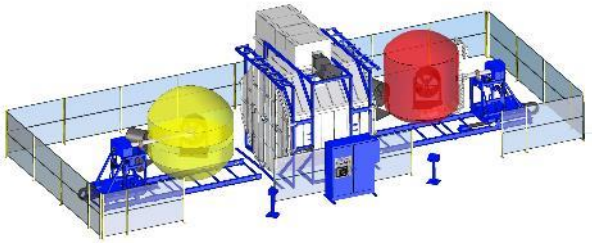
Independent
3-Arm 5-Station



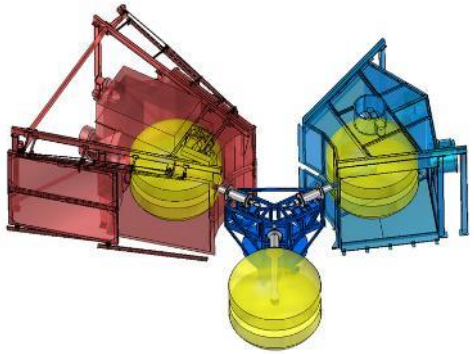
Independent
4-Arm 5-Station



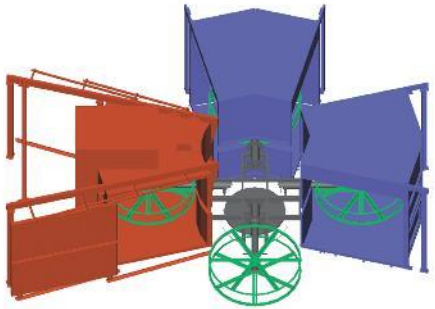
Shuttle
1-Arm



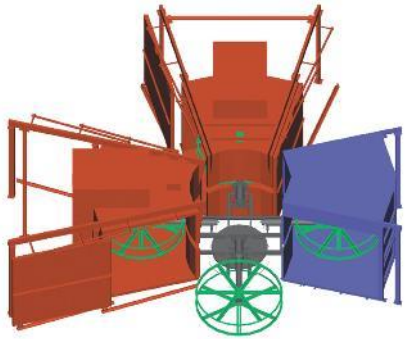
Shuttle
2-Arm



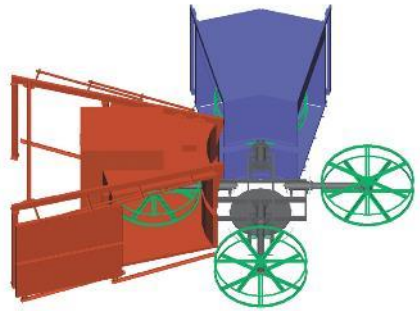
Turret
3-Arm



Turret
4-Arm 2-Cool



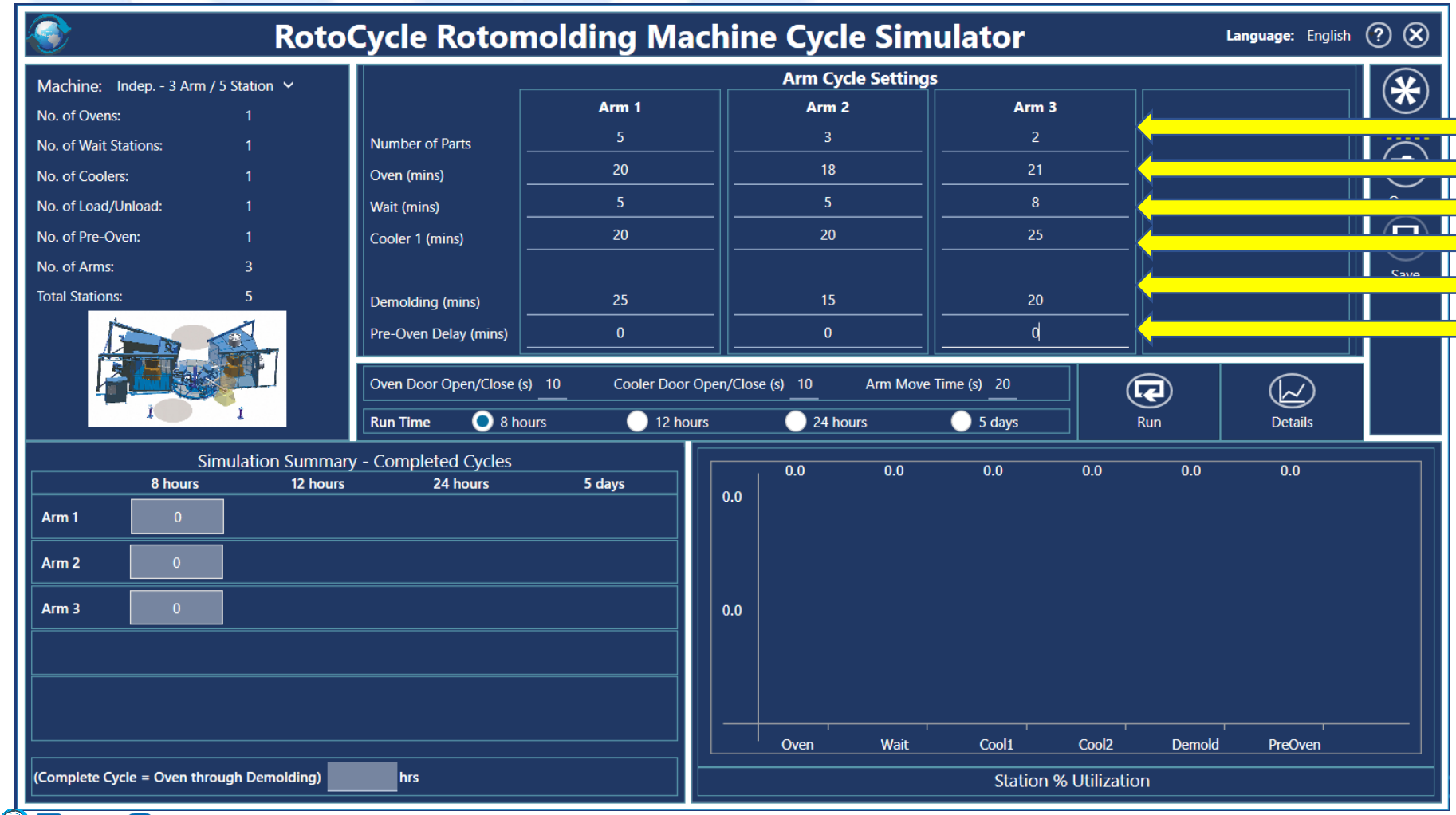
Turret
4-Arm 2-Oven



Turret
4-Arm 2-Load/Unload

Step-by-Step Guide to Running a Simulation

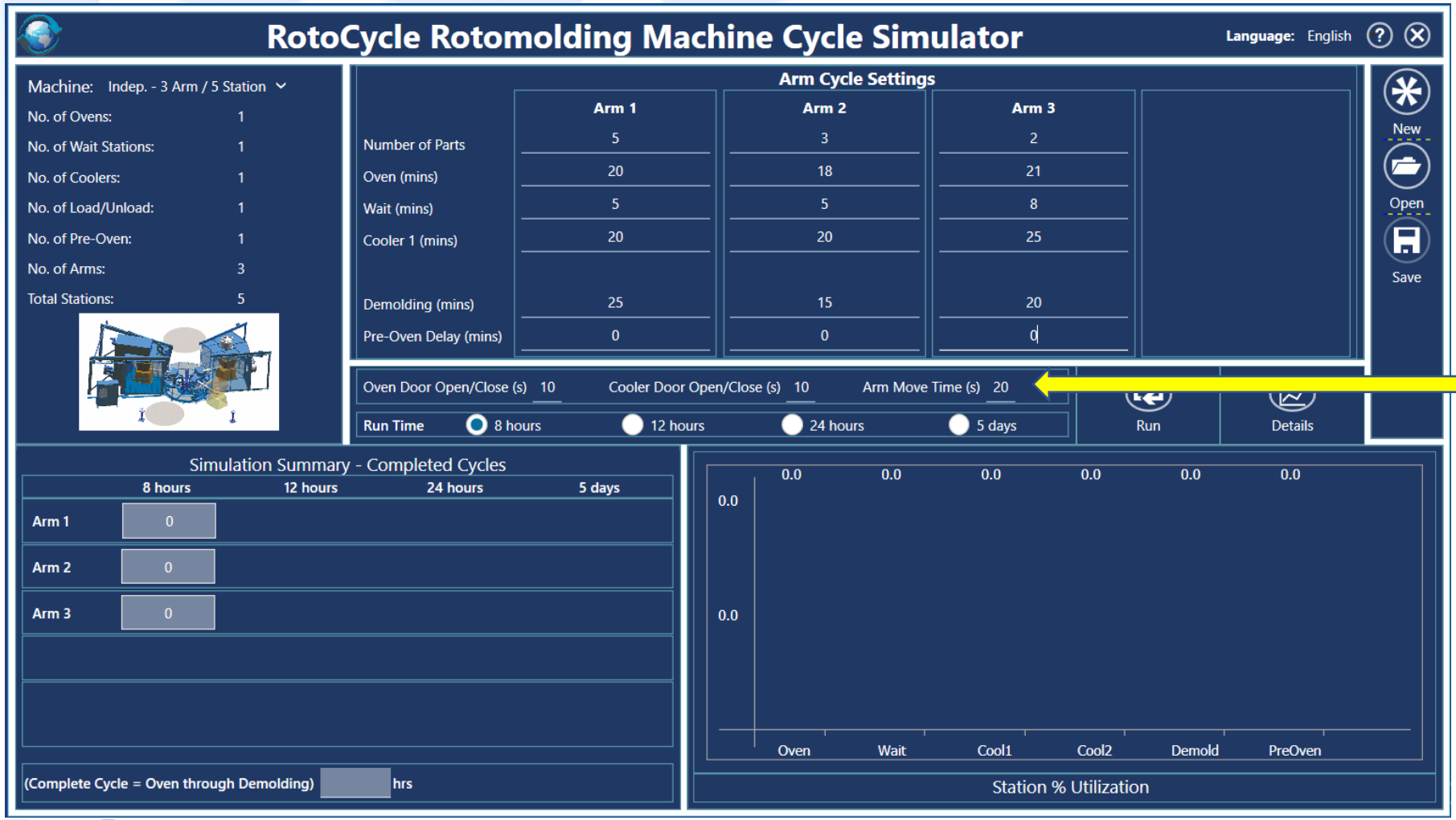
Step 2. Input **Machine Setup/Cycle Details** – the screen will adjust to the number of arms & stations available



- Number of Molds per Arm
- Oven Cycle Time
- Wait time at Intermediate Station
- Primary Cool Station 1
- Demolding or Service Time
- Pre-Oven Delay or Service Time

Step-by-Step Guide to Running a Simulation

Step 3. Adjust **Door Open/Close** time and/or **Arm Move** time if necessary

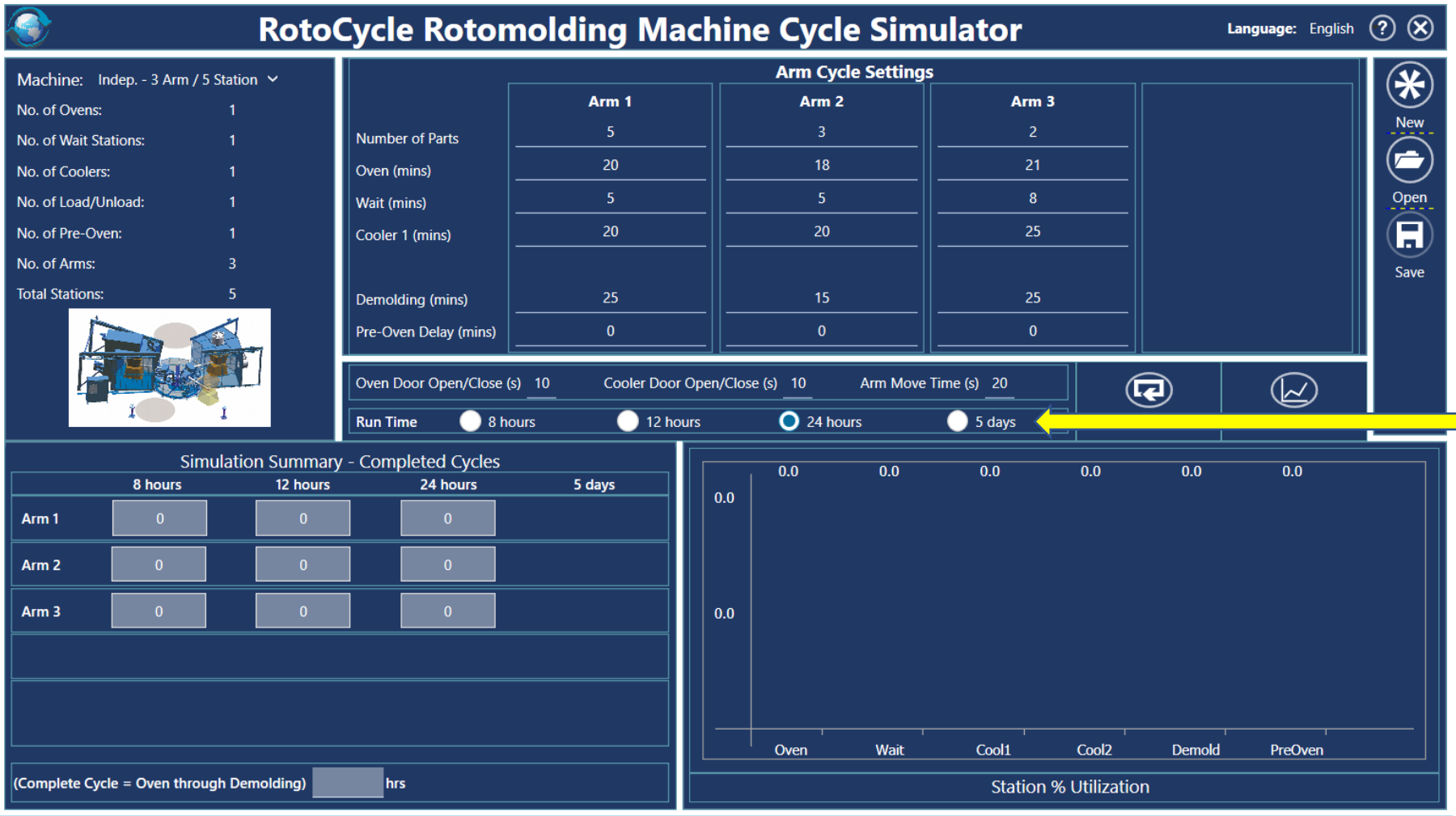


Door Open/Close time
Arm Move time

These are set to commonly observed times for larger machines. Adjust as necessary to ensure accurate simulation.

Step-by-Step Guide to Running a Simulation

Step 4. Choose a simulation **Run Time** – 8 hours, 12 hours, 24 hours, 5 days

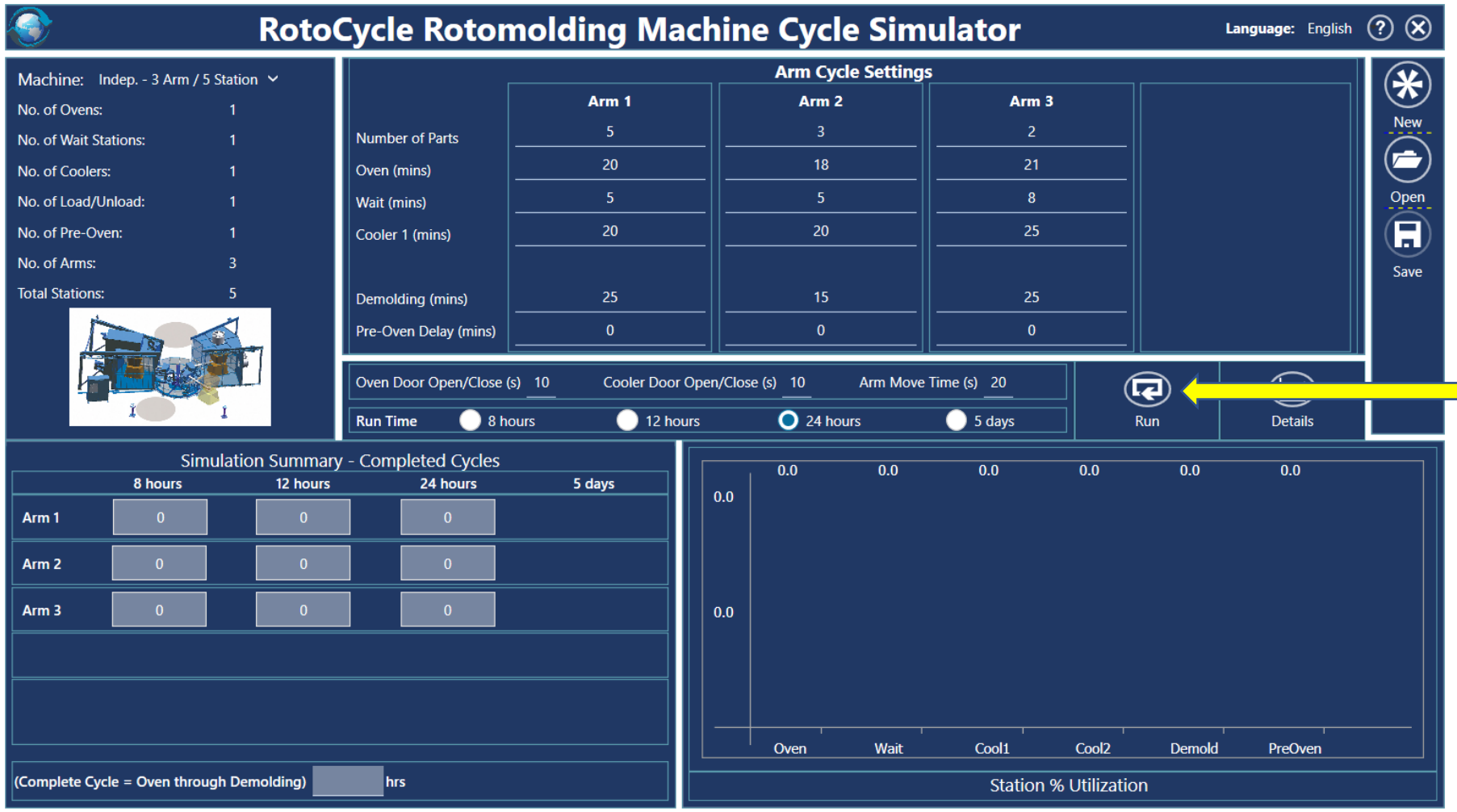


Run Time Selection (e.g.: 24 hours)

The simulation starts from a ‘cold’ position where no arms have yet passed through the oven.

Step-by-Step Guide to Running a Simulation

Step 5. Start the simulation by pressing '**Run**'

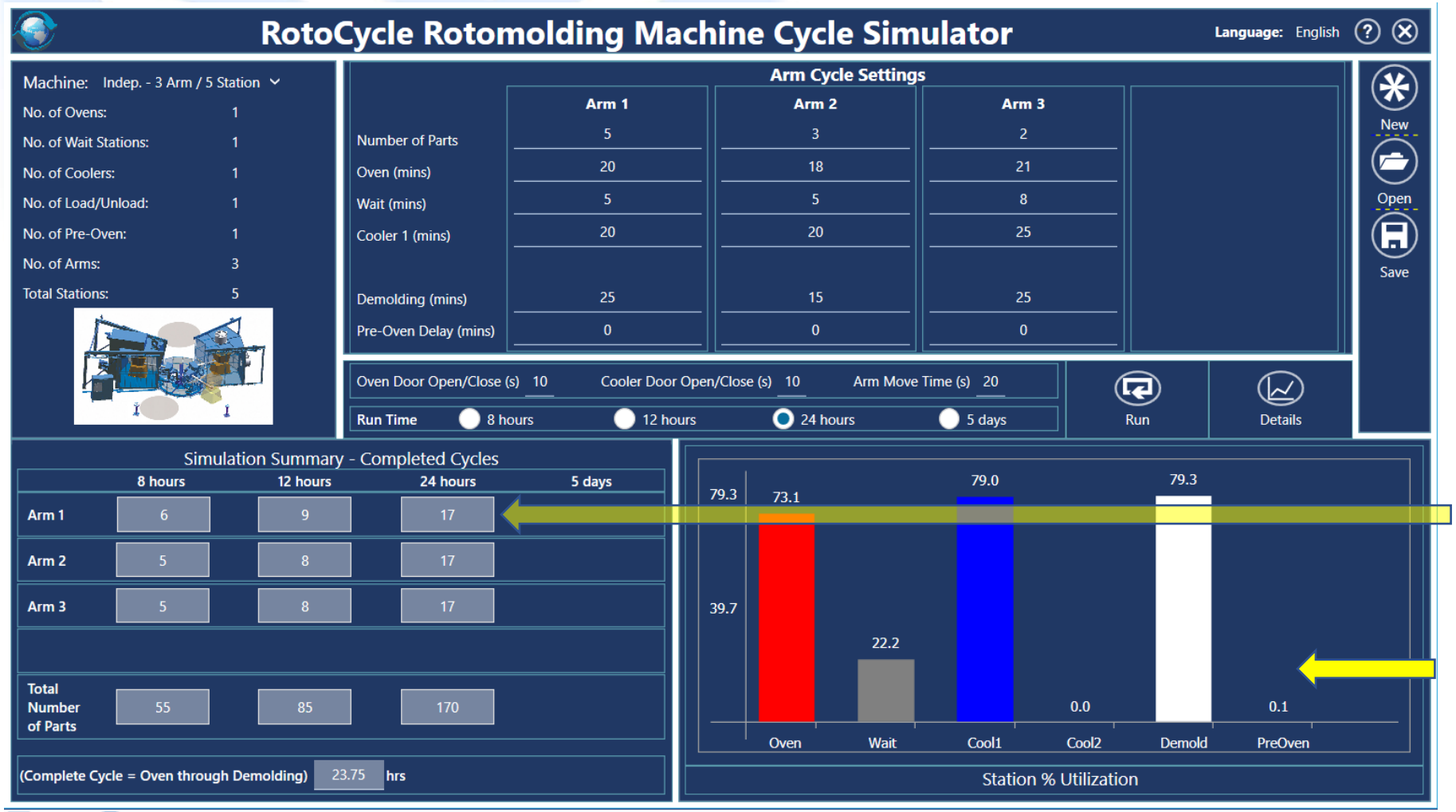


Start Simulation

Pressing 'Run' starts the program which takes the input data for each arm and uses an incremental time step process to simulate the movement of the arms relative to each other

Step-by-Step Guide to Running a Simulation

Step 6. Simulation details are displayed on the screen

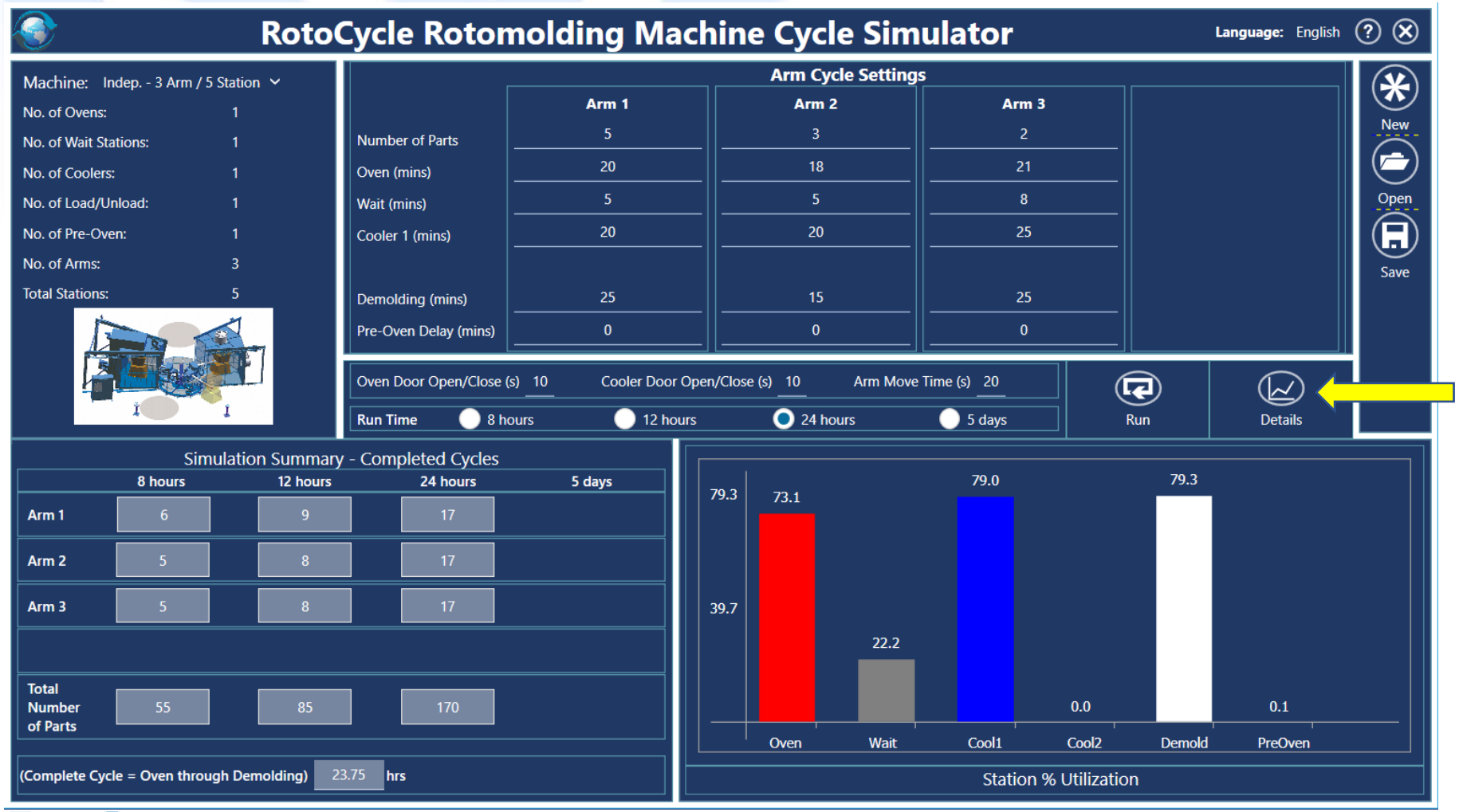


The total number of arms per time-period are displayed as well as the total number of parts produced.

% Utilization of the machine stations shows where potential delays occur in production – in this case arms are delayed in the wait station 22.2% of the time.

Step-by-Step Guide to Running a Simulation

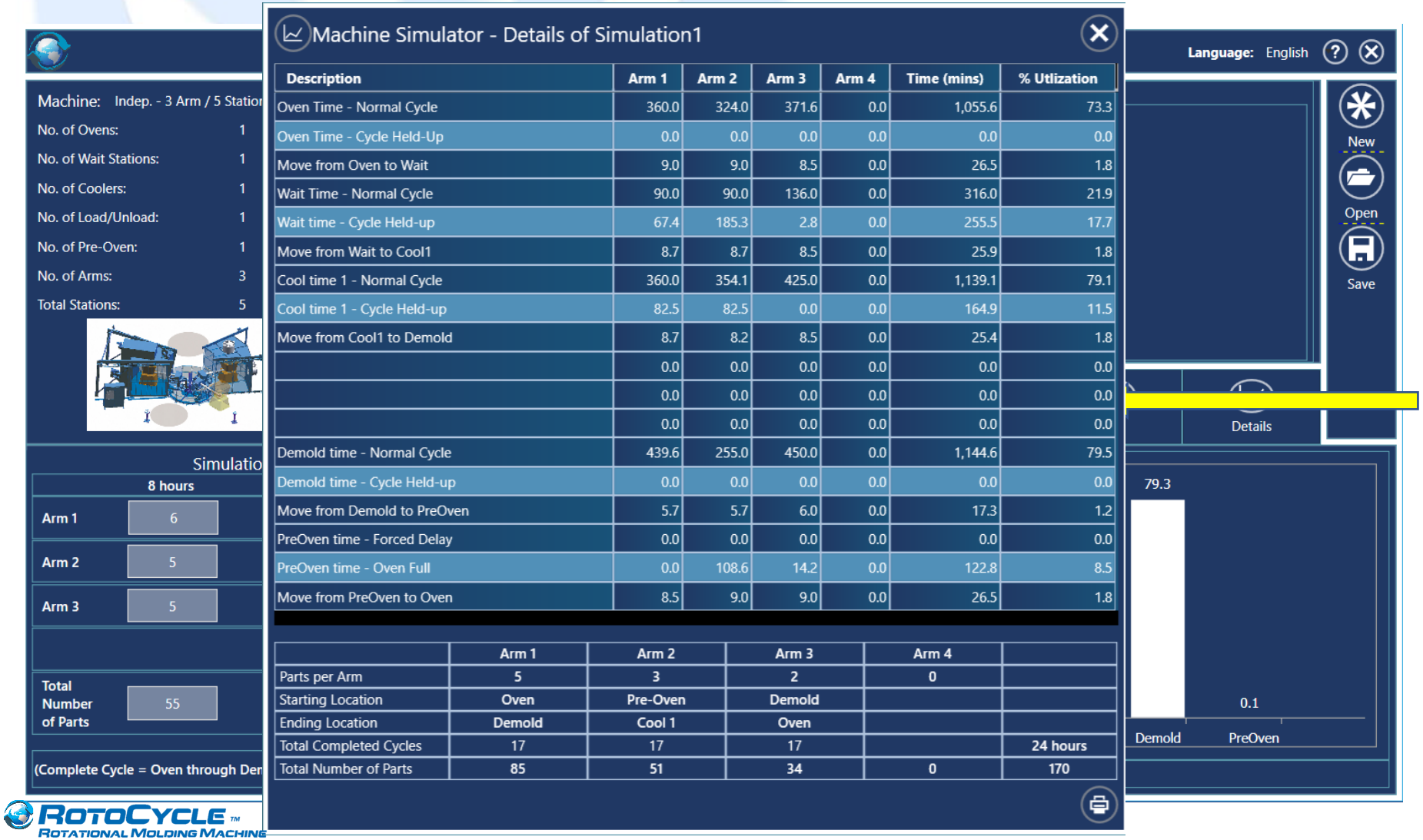
Step 7. View cycle breakdown in '**Details**' if required



For a more detailed breakdown of the movement of the arms, press 'Details'

Step-by-Step Guide to Running a Simulation

Step 8. Station-by-Station times and % utilization are displayed



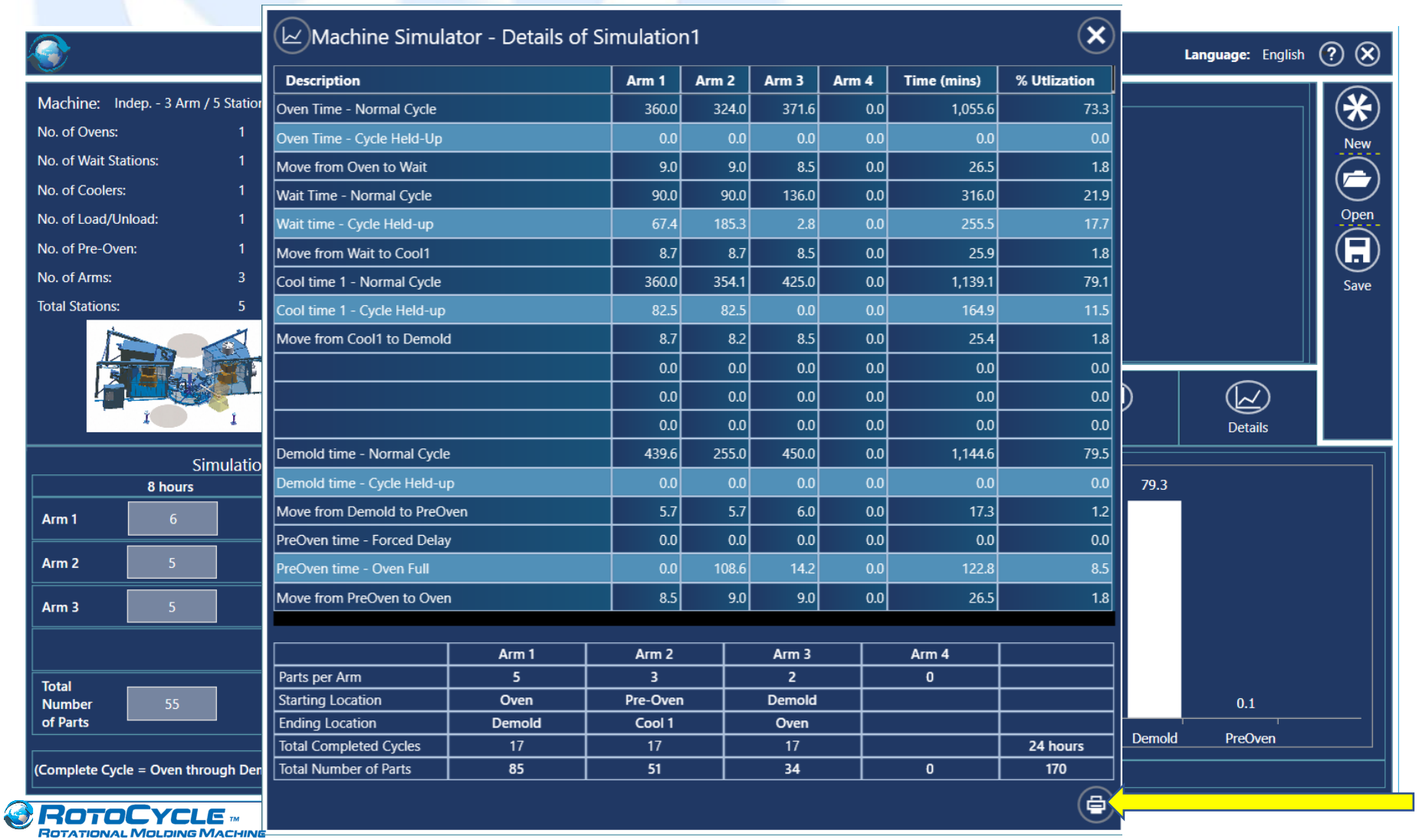
Description	Arm 1	Arm 2	Arm 3	Arm 4	Time (mins)	% Utlization
Oven Time - Normal Cycle	360.0	324.0	371.6	0.0	1,055.6	73.3
Oven Time - Cycle Held-Up	0.0	0.0	0.0	0.0	0.0	0.0
Move from Oven to Wait	9.0	9.0	8.5	0.0	26.5	1.8
Wait Time - Normal Cycle	90.0	90.0	136.0	0.0	316.0	21.9
Wait time - Cycle Held-up	67.4	185.3	2.8	0.0	255.5	17.7
Move from Wait to Cool1	8.7	8.7	8.5	0.0	25.9	1.8
Cool time 1 - Normal Cycle	360.0	354.1	425.0	0.0	1,139.1	79.1
Cool time 1 - Cycle Held-up	82.5	82.5	0.0	0.0	164.9	11.5
Move from Cool1 to Demold	8.7	8.2	8.5	0.0	25.4	1.8
	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0
Demold time - Normal Cycle	439.6	255.0	450.0	0.0	1,144.6	79.5
Demold time - Cycle Held-up	0.0	0.0	0.0	0.0	0.0	0.0
Move from Demold to PreOven	5.7	5.7	6.0	0.0	17.3	1.2
PreOven time - Forced Delay	0.0	0.0	0.0	0.0	0.0	0.0
PreOven time - Oven Full	0.0	108.6	14.2	0.0	122.8	8.5
Move from PreOven to Oven	8.5	9.0	9.0	0.0	26.5	1.8

	Arm 1	Arm 2	Arm 3	Arm 4	
Parts per Arm	5	3	2	0	
Starting Location	Oven	Pre-Oven	Demold		
Ending Location	Demold	Cool 1	Oven		
Total Completed Cycles	17	17	17		24 hours
Total Number of Parts	85	51	34	0	170

A breakdown of the movement of the arms by station allows delays and the % utilization of the machine to be examined.

Step-by-Step Guide to Running a Simulation

Step 9. Print a copy of the Simulation Details



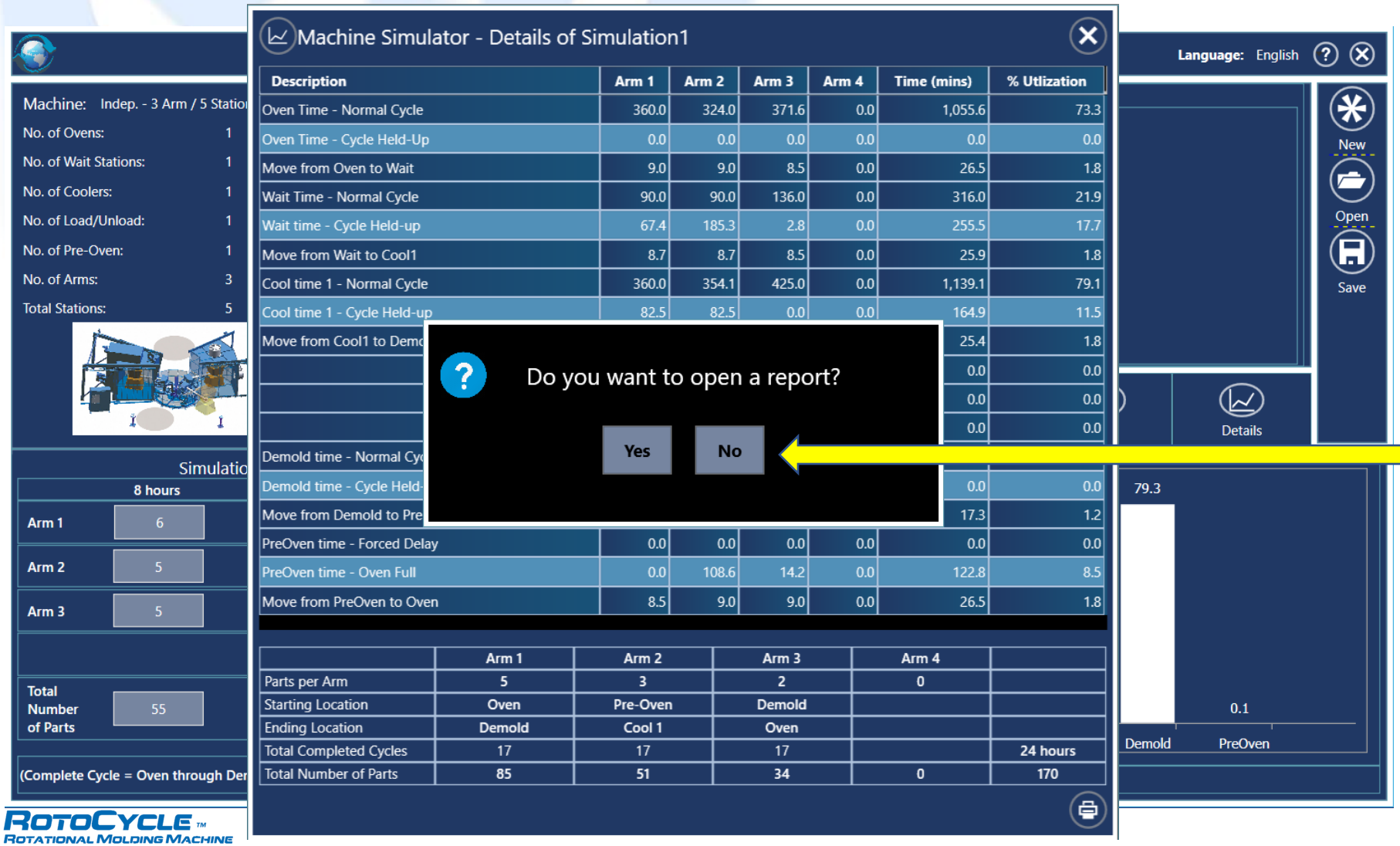
Description	Arm 1	Arm 2	Arm 3	Arm 4	Time (mins)	% Utlization
Oven Time - Normal Cycle	360.0	324.0	371.6	0.0	1,055.6	73.3
Oven Time - Cycle Held-Up	0.0	0.0	0.0	0.0	0.0	0.0
Move from Oven to Wait	9.0	9.0	8.5	0.0	26.5	1.8
Wait Time - Normal Cycle	90.0	90.0	136.0	0.0	316.0	21.9
Wait time - Cycle Held-up	67.4	185.3	2.8	0.0	255.5	17.7
Move from Wait to Cool1	8.7	8.7	8.5	0.0	25.9	1.8
Cool time 1 - Normal Cycle	360.0	354.1	425.0	0.0	1,139.1	79.1
Cool time 1 - Cycle Held-up	82.5	82.5	0.0	0.0	164.9	11.5
Move from Cool1 to Demold	8.7	8.2	8.5	0.0	25.4	1.8
	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0
Demold time - Normal Cycle	439.6	255.0	450.0	0.0	1,144.6	79.5
Demold time - Cycle Held-up	0.0	0.0	0.0	0.0	0.0	0.0
Move from Demold to PreOven	5.7	5.7	6.0	0.0	17.3	1.2
PreOven time - Forced Delay	0.0	0.0	0.0	0.0	0.0	0.0
PreOven time - Oven Full	0.0	108.6	14.2	0.0	122.8	8.5
Move from PreOven to Oven	8.5	9.0	9.0	0.0	26.5	1.8

	Arm 1	Arm 2	Arm 3	Arm 4	
Parts per Arm	5	3	2	0	
Starting Location	Oven	Pre-Oven	Demold		
Ending Location	Demold	Cool 1	Oven		
Total Completed Cycles	17	17	17		24 hours
Total Number of Parts	85	51	34	0	170

Press the print button to produce a report of the details.

Step-by-Step Guide to Running a Simulation

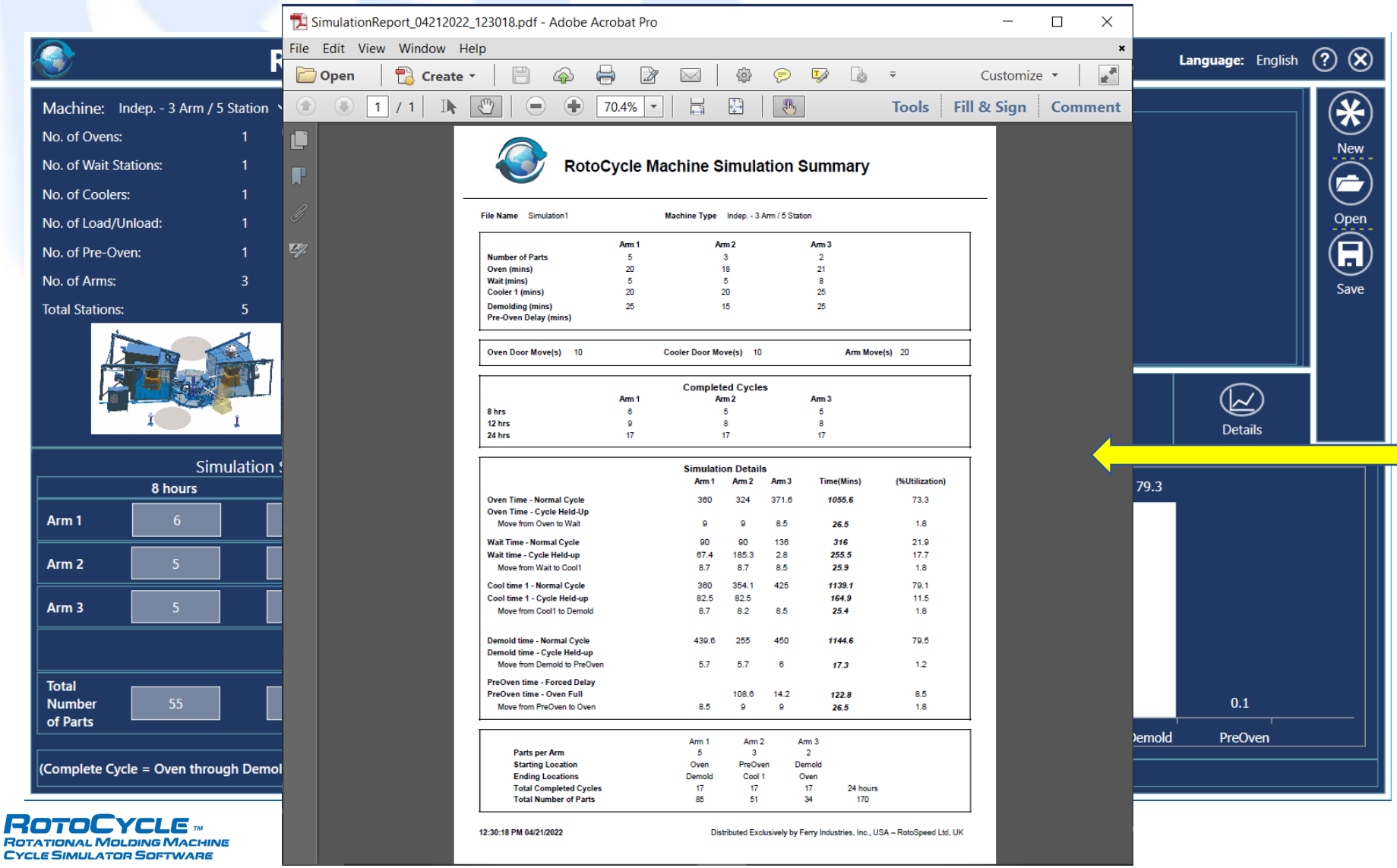
Step 10. Print a copy of the Simulation Details



Select ‘Yes’ to prepare a report/print-out of the details page.

Step-by-Step Guide to Running a Simulation

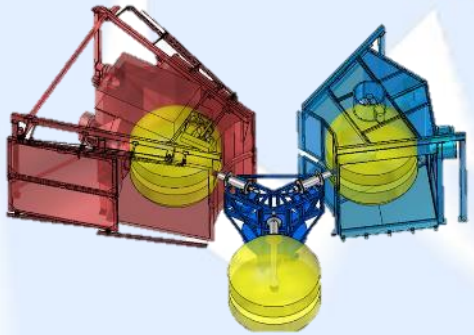
Step 11. Report of Simulation



Print or Save report as required.

Sample Output

1. Balanced Cycles – Turret Machine



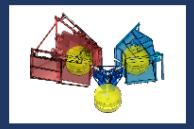
- Most efficient style of machine for output when cycles are balanced
- Minimal delay in stations with good management of demolding station

RotoCycle Rotomolding Machine Cycle Simulator

Language: English

Machine: Turret - 3 Arm

No. of Ovens:	1
No. of Wait Stations:	0
No. of Coolers:	1
No. of Load/Unload:	1
No. of Pre-Oven:	0
No. of Arms:	3
Total Stations:	3



Arm Cycle Settings

	Arm 1	Arm 2	Arm 3
Number of Parts	4	6	4
Oven (mins)	14	14	14
Cooler 1 (mins)	14	14	14
Demolding (mins)	14	14	14

New | Open | Save

Oven Door Open/Close (s) 10 | Cooler Door Open/Close (s) 10 | Arm Move Time (s) 20

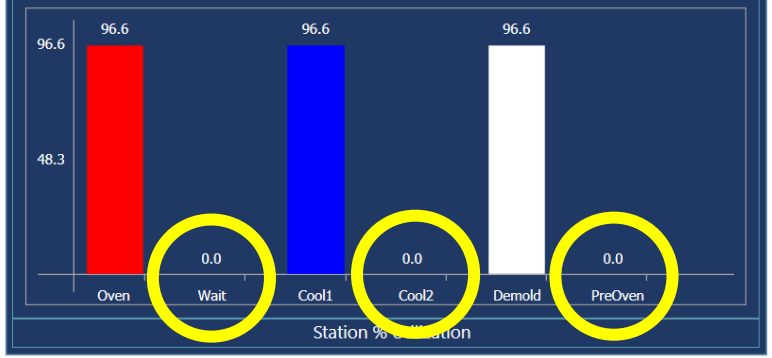
Run Time: 8 hours | 12 hours | 24 hours | 5 days

Run | Details

Simulation Summary - Completed Cycles

	8 hours	12 hours	24 hours	5 days
Arm 1	11	16	33	165
Arm 2	10	16	32	165
Arm 3	10	15	32	164
Total Number of Parts	144	220	452	2306

(Complete Cycle = Oven through Demolding) 119.87 hrs



Machine Simulator - Details of Simulation1

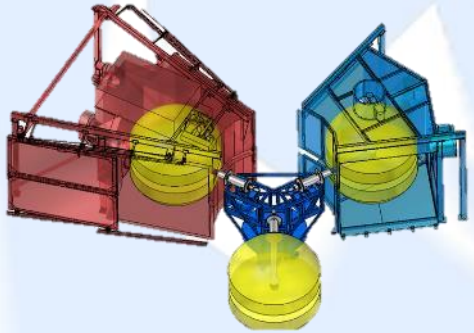
Description	Arm 1	Arm 2	Arm 3	Arm 4	Time (mins)	% Utlization
Oven Time - Normal Cycle	2,324.0	2,318.0	2,310.0	0.0	6,952.0	96.6
Oven Time - Cycle Held-Up	2.8	2.8	0.0	0.0	5.5	0.1
Move from Oven to Cool1	80.2	79.8	82.5	0.0	242.5	3.4
	0.0	0.0	0.0	0.0	0.0	
	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	
Cool time 1 - Normal Cycle	2,318.0	2,310.0	2,324.0	0.0	6,952.0	96.6
Cool time 1 - Cycle Held-up	2.8	2.8	0.0	0.0	5.5	0.1
Move from Cool1 to Demold	79.8	79.8	83.0	0.0	242.5	3.4
	0.0	0.0	0.0	0.0	0.0	
	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0
Demold time - Normal Cycle	2,310.0	2,324.0	2,318.0	0.0	6,952.0	96.6
Demold time - Cycle Held-up	2.8	2.8	0.0	0.0	5.5	0.1
Move from Demold to Oven	79.8	80.2	82.5	0.0	242.5	3.4
	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0

	Arm 1	Arm 2	Arm 3	Arm 4	
Parts per Arm	4	6	4	0	
Starting Location	Oven	Demold	Cool 1		
Ending Location	Cool 1	Oven	Demold		
Total Completed Cycles	165	165	164		5 days
Total Number of Parts	660	990	656	0	2306

RotoCycle™ Rotational Molding Machine Cycle Simulator Software

FERRY INDUSTRIES, INC.

1a. Out-of-Balance Cycles – Turret Machine



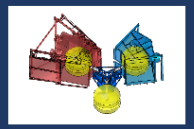
- If one arm or one station setting is out of alignment with the other stations, the imbalance is multiplied across the other arms
- Delays can affect cure if arms are left to soak in the oven and difficulty demolding if arms are left to cool too long

RotoCycle Rotomolding Machine Cycle Simulator

Language: English

Machine: Turret - 3 Arm

No. of Ovens:	1
No. of Wait Stations:	0
No. of Coolers:	1
No. of Load/Unload:	1
No. of Pre-Oven:	0
No. of Arms:	3
Total Stations:	3



Arm Cycle Settings

	Arm 1	Arm 2	Arm 3
Number of Parts	4	6	4
Oven (mins)	14	14	14
Cooler 1 (mins)	14	14	14
Demolding (mins)	20	14	14

New | Open | Save

Oven Door Open/Close (s) 10 | Cooler Door Open/Close (s) 10 | Arm Move Time (s) 20

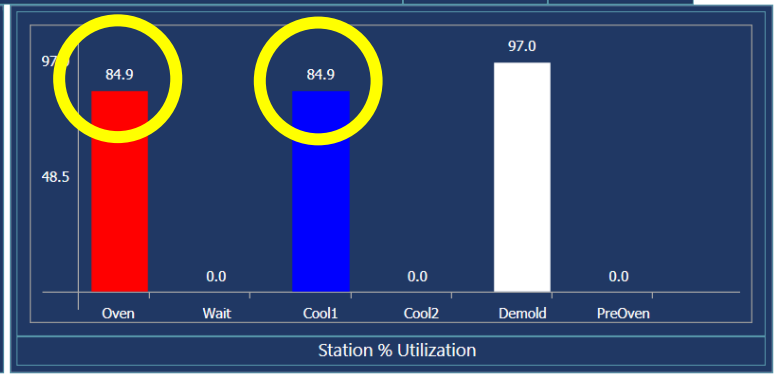
Run Time: 8 hours | 12 hours | 24 hours | 5 days

Run | Details

Simulation Summary - Completed Cycles

	8 hours	12 hours	24 hours	5 days
Arm 1	9	14	29	145
Arm 2	9	14	28	145
Arm 3	9	13	28	144
Total Number of Parts	126	192	396	2026

(Complete Cycle = Oven through Demolding) 119.87 hrs



Station % Utilization

Machine Simulator - Details of Simulation1

Description	Arm 1	Arm 2	Arm 3	Arm 4	Time (mins)	% Utlization
Oven Time - Normal Cycle	2,044.0	2,038.0	2,030.0	0.0	6,112.0	84.9
Oven Time - Cycle Held-Up	0.0	2.4	872.4	0.0	874.8	12.2
Move from Oven to Cool1	73.0	70.1	70.1	0.0	213.2	3.0
	0.0	0.0	0.0	0.0	0.0	
	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	
Cool time 1 - Normal Cycle	2,038.0	2,030.0	2,044.0	0.0	6,112.0	84.9
Cool time 1 - Cycle Held-up	0.0	872.4	2.4	0.0	874.8	12.2
Move from Cool1 to Demold	72.5	70.1	70.6	0.0	213.2	3.0
	0.0	0.0	0.0	0.0	0.0	
	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0
Demold time - Normal Cycle	2,900.0	2,044.0	2,038.0	0.0	6,982.0	97.0
Demold time - Cycle Held-up	0.0	2.4	2.4	0.0	4.8	0.1
Move from Demold to Oven	72.5	70.6	70.1	0.0	213.2	3.0
	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0

	Arm 1	Arm 2	Arm 3	Arm 4	
Parts per Arm	4	6	4	0	
Starting Location	Oven	Demold	Cool 1		
Ending Location	Cool 1	Oven	Demold		
Total Completed Cycles	145	145	144		5 days
Total Number of Parts	580	870	576	0	2026

RotoCycle™ Rotational Molding Machine Cycle Simulator Software

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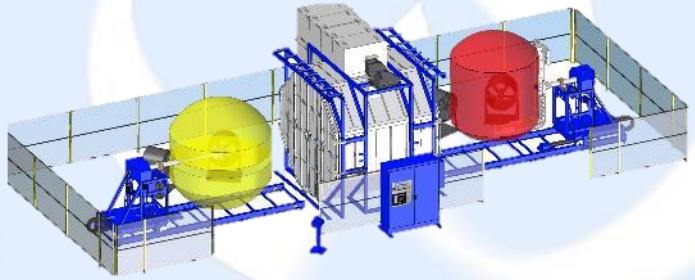
2. 2-Arm Shuttle Machine



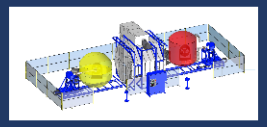
- Good machine design for large size, lower quantity parts
- Can allow for one arm to ‘bypass’ the other if mixing long and short cycles

RotoCycle Rotomolding Machine Cycle Simulator

Language: English

Machine: Shuttle - 2 Arm

No. of Ovens:	1
No. of Wait Stations:	0
No. of Coolers:	2
No. of Load/Unload:	2
No. of Pre-Oven:	0
No. of Arms:	2
Total Stations:	3



Arm Cycle Settings

	Arm 1	Arm 2
Number of Parts	4	6
Oven (mins)	14	20
Cooler 1 (mins)	14	
Cooler 2 (mins)		30
Demolding (mins)	14	25

New | Open | Save

Oven Door Open/Close (s) 10 | Cooler Door Open/Close (s) 0 | Arm Move Time (s) 20

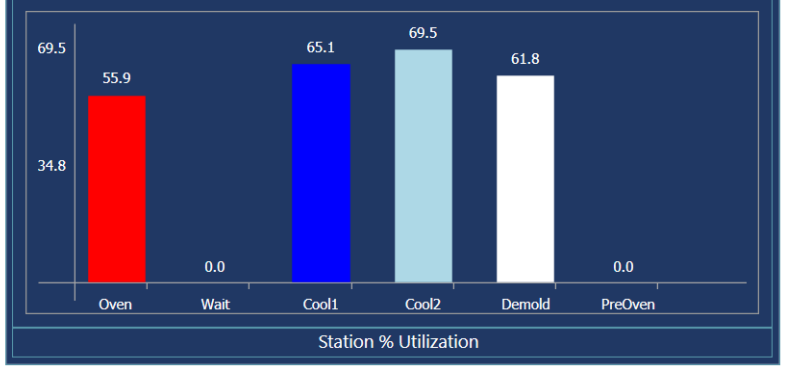
Run Time: 8 hours | 12 hours | 24 hours | 5 days

Run | Details

Simulation Summary - Completed Cycles

	8 hours	12 hours	24 hours	5 days
Arm 1	11	16	33	167
Arm 2	5	8	16	83
Total Number of Parts	74	112	228	1166

(Complete Cycle = Oven through Demolding) 119.74 hrs



Station % Utilization

Machine Simulator - Details of Simulation1

Description	Arm 1	Arm 2	Arm 3	Arm 4	Time (mins)	% Utlization
Oven Time - Normal Cycle	2,352.0	1,680.0	0.0	0.0	4,032.0	56.0
Oven Time - Cycle Held-Up	0.0	0.0	0.0	0.0	0.0	0.0
Move from Oven to Cool1	84.0	42.0	0.0	0.0	126.0	1.8
	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0
Cool time 1 - Normal Cycle	2,339.0	0.0	0.0	0.0	2,339.0	32.5
Cool time 1 - Cycle Held-up	0.0	0.0	0.0	0.0	0.0	0.0
Move from Cool1 to Demold	0.0	0.0	0.0	0.0	0.0	0.0
Cool time 2 - Normal Cycle	0.0	2,513.0	0.0	0.0	2,513.0	34.9
Cool time 2 - Cycle held-up	0.0	0.0	0.0	0.0	0.0	0.0
Move from Cool2 to Demold	0.0	0.0	0.0	0.0	0.0	0.0
Demold time - Normal Cycle	2,338.0	2,100.0	0.0	0.0	4,438.0	61.6
Demold time - Cycle Held-up	3.5	824.4	0.0	0.0	827.9	11.5
Move from Demold to Oven	83.5	40.6	0.0	0.0	124.1	1.7
	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0

	Arm 1	Arm 2	Arm 3	Arm 4	
Parts per Arm	4	6	0	0	
Starting Location	Oven	Demold			
Ending Location	Cool 1	Cool 1			
Total Completed Cycles	167	83			5 days
Total Number of Parts	668	498	0	0	1166

RotoCycle™ Rotational Molding Machine Cycle Simulator Software

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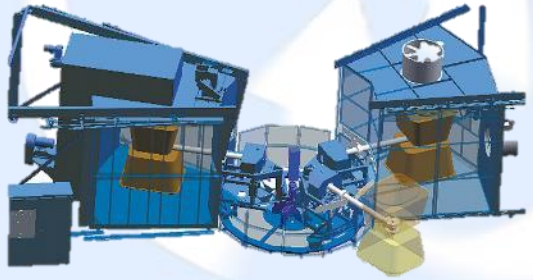
3. Independent Arm Machine – Variable Cycles



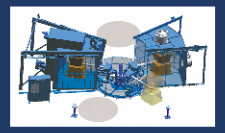
- Most common and flexible machine design for mixed production models
- Longer station settings can create training delays as arms behind wait
- 3 arms with 5 stations provides two levels of redundancy to help reduce these delays between stations when different cycle times are used

RotoCycle Rotomolding Machine Cycle Simulator

Language: English

Machine: Indep. - 3 Arm / 5 Station

No. of Ovens:	1
No. of Wait Stations:	1
No. of Coolers:	1
No. of Load/Unload:	1
No. of Pre-Oven:	1
No. of Arms:	3
Total Stations:	5



Arm Cycle Settings

	Arm 1	Arm 2	Arm 3
Number of Parts	4	6	4
Oven (mins)	14	20	16
Wait (mins)	0	0	0
Cooler 1 (mins)	14	25	18
Demolding (mins)	14	25	10
Pre-Oven Delay (mins)	0	0	0

New | Open | Save

Oven Door Open/Close (s) 10 | Cooler Door Open/Close (s) 10 | Arm Move Time (s) 20

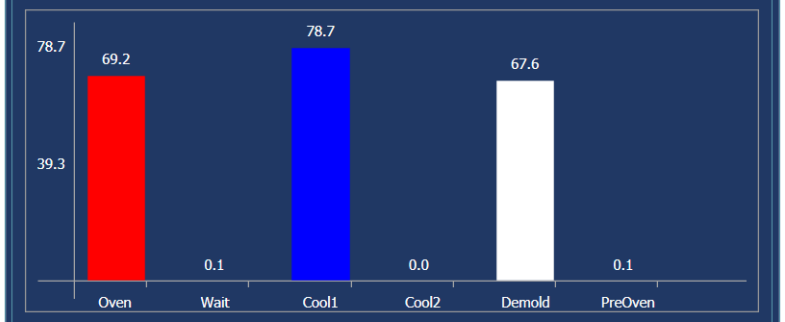
Run Time: 8 hours | 12 hours | 24 hours | 5 days

Run | Details

Simulation Summary - Completed Cycles

	8 hours	12 hours	24 hours	5 days
Arm 1	7	10	20	99
Arm 2	6	9	19	99
Arm 3	6	9	19	99
Total Number of Parts	88	130	270	1386

(Complete Cycle = Oven through Demolding) 119.77 hrs



Station % Utilization

Machine Simulator - Details of Simulation1

Description	Arm 1	Arm 2	Arm 3	Arm 4	Time (mins)	% Utlization
Oven Time - Normal Cycle	1,400.0	2,000.0	1,587.0	0.0	4,987.0	69.3
Oven Time - Cycle Held-Up	0.0	0.0	0.0	0.0	0.0	0.0
Move from Oven to Wait	50.0	50.0	49.5	0.0	149.5	2.1
Wait Time - Normal Cycle	0.0	0.0	0.0	0.0	0.0	
Wait time - Cycle Held-up	1,961.9	0.0	891.0	0.0	2,852.9	39.6
Move from Wait to Cool1	48.4	50.0	47.9	0.0	146.2	2.0
Cool time 1 - Normal Cycle	1,400.0	2,478.0	1,782.0	0.0	5,660.0	78.6
Cool time 1 - Cycle Held-up	0.0	0.0	678.2	0.0	678.2	9.4
Move from Cool1 to Demold	50.0	49.5	47.9	0.0	147.4	2.0
	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0
Demold time - Normal Cycle	1,395.0	2,475.0	1,000.0	0.0	4,870.0	67.6
Demold time - Cycle Held-up	0.0	0.0	5.0	0.0	5.0	0.1
Move from Demold to PreOven	33.0	33.0	33.3	0.0	99.3	1.4
PreOven time - Forced Delay	0.0	0.0	0.0	0.0	0.0	0.0
PreOven time - Oven Full	812.3	14.5	1,028.3	0.0	1,855.1	25.8
Move from PreOven to Oven	49.5	50.0	50.0	0.0	149.5	2.1

	Arm 1	Arm 2	Arm 3	Arm 4	
Parts per Arm	4	6	4	0	
Starting Location	Oven	Pre-Oven	Demold		
Ending Location	Demold	Cool 1	Oven		
Total Completed Cycles	99	99	99		5 days
Total Number of Parts	396	594	396	0	1386

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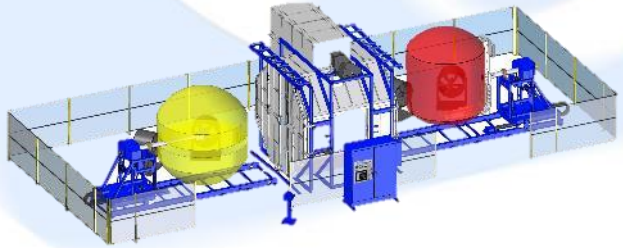
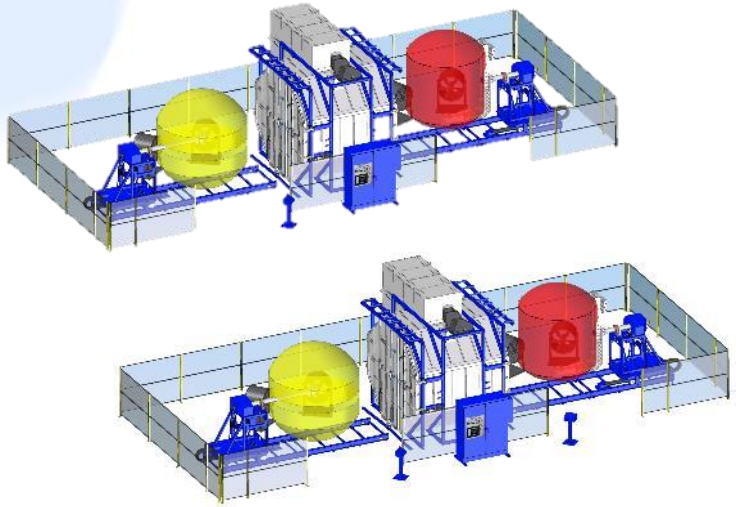
Examples & Analysis

4. Comparing Machine Styles

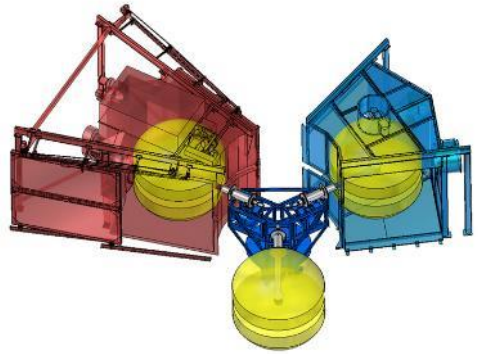
- RotoCycle can be used to evaluate machine styles prior to setting up an operation, allowing a comparison of output rates vs. labor requirements vs. space – many permutations are possible
- Example: Shuttle vs. Turret



14 min Heat / Cool / Demold
66 arms per 24 hours
2 operator demolding stations



14 min Heat / Cool / Demold
132 arms per 24 hours
2 operator demolding stations



14 min Heat / Cool / Demold
97 arms per 24 hours
1 operator demolding stations

- Efficiency comparison can be made in terms of parts/hour/operator, initial capital outlay, space required
- Flexibility of a double shuttle installation is higher than turret due to ability to separate arms from others

4. Comparing Machine Styles

Other comparisons:

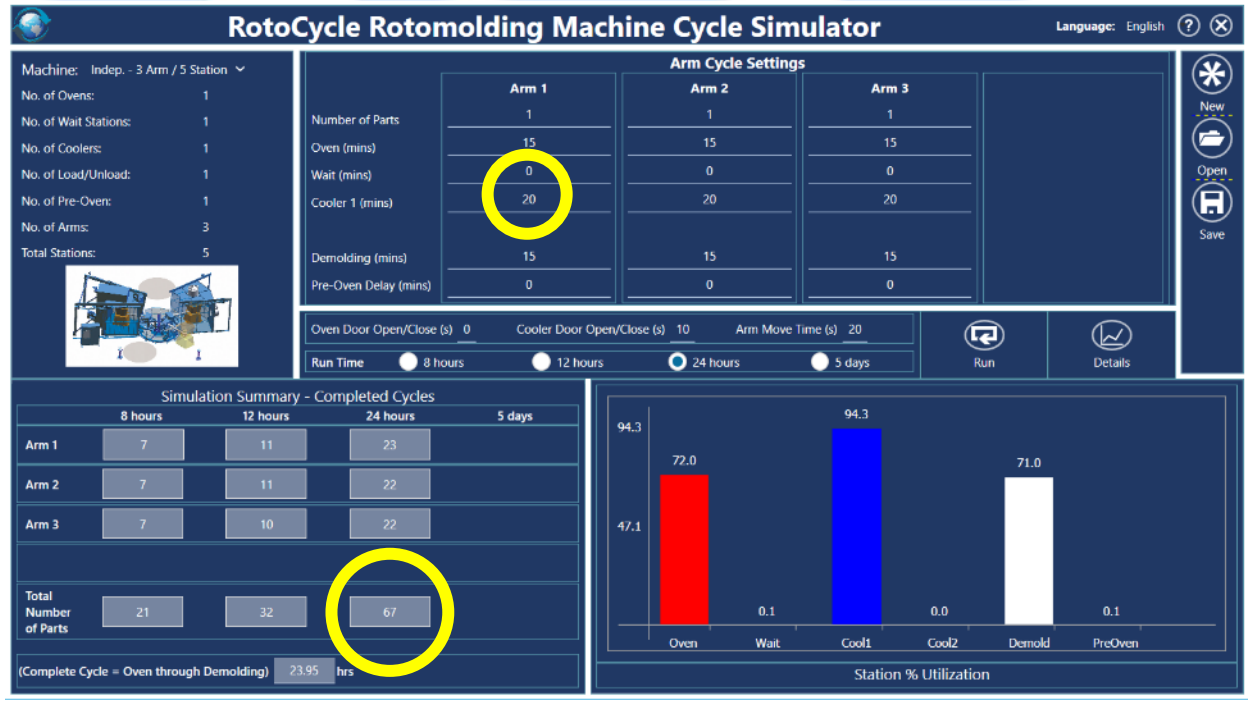
- 3-arm, 5-station independent-arm machine vs. 4-arm, 5-station independent-arm machine
  - Using 4 arms on a 5-station layout reduces the flexibility of the machine if cycles are significantly out-of-balance
  - RotoCycle allows an analysis of the degree of out-of-balance vs. output rates

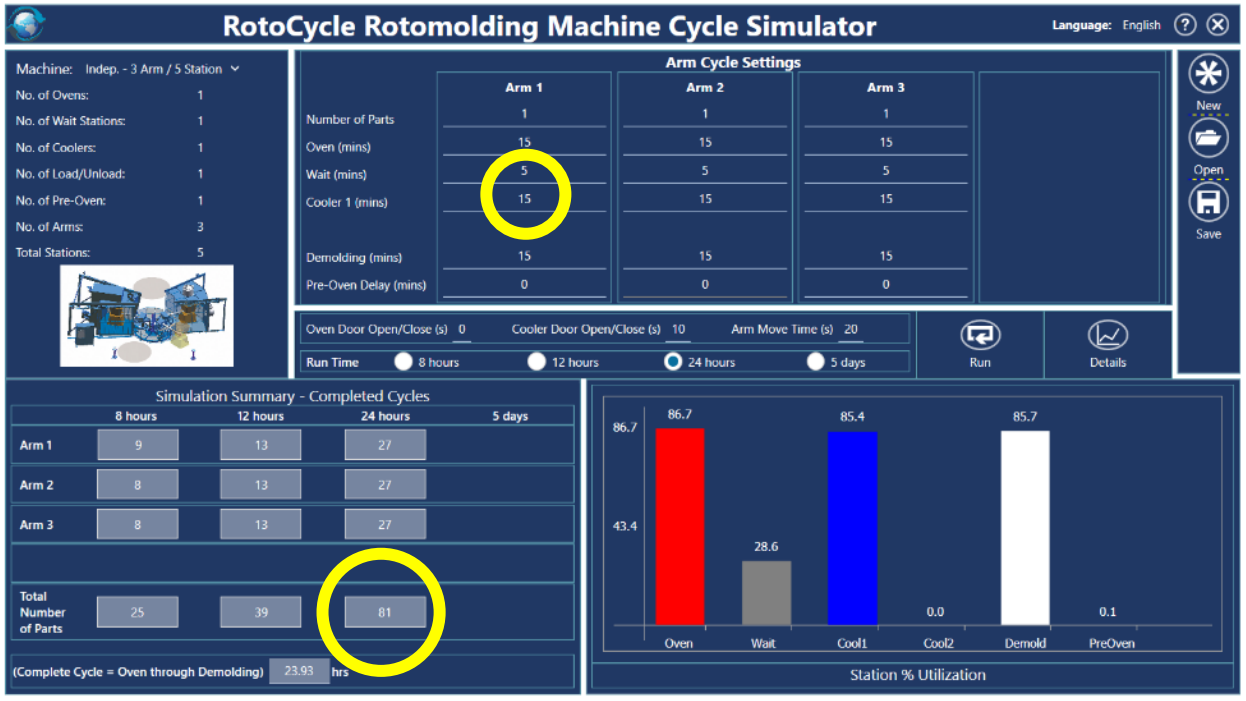
- 3-arm, 5-station independent-arm machine vs. 4-arm, 6-station independent-arm machine
  - A 4-arm, 6-station design increase the number of molds in-service but retains the two levels of redundancy
  - Throughput rates per mold may be reduced as the number of active molds is higher and the time to pass through the machine requires another station

- 4-arm Fixed-arm turret vs. 4-arm, 5-station independent-arm machine
  - For balanced cycles, the 4-arm turret will be more capital efficient and also forces attention on the demolding station more
  - For imbalanced cycles, the independent-arm machine will have slightly more flexibility but with only one degree of redundancy can easily be delayed

5. Balancing Cycles for Optimum Output

- RotoCycle can be used to assess ‘what-if’ scenarios for improving the production rhythm of the machine
- Example: Dividing cooling time between stations on a 3-arm, 5-station independent machine





- In this simple example, when all cooling of 20 mins is carried out in the main cooling station (left scenario), the maximum output for 24 hours is 67 arms
- When the cooling cycle is split between the wait station and the main cooling station as 5 mins and 15 mins (right scenario), the maximum output for 24 hours rise to 81 arms
- May require additional cooling fans in the wait station

6. Productivity Analysis

- RotoCycle can be used to develop ideal production targets for comparison with actual

- Oven and cooling cycle times are most often fixed parameters
- Cooling times may vary according to ambient conditions
- Demolding times are the most commonly under-estimated component of the machine cycle
- Outputs based on estimates will often be low

- RotoCycle can be used to establish the ideal output and focus attention on the longest cycle elements (typically demolding)
  - Or help balance stations
  - Or identify the best mix of molds (based on their thickness and cycle times)
- Actual output rates (number of arms turned per shift, for example) vs. ideal targets can be modelled using RotoCycle by increasing the demolding times (or direct observation) to match

- Good tool for supervision in setting and monitoring targets

RotoCycle™
Rotational Molding Machine
Cycle Simulator Software

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