August 2020

Minimizing Manufacturing Costs with MATLAB, Machine Learning & RPA

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Today’s Agenda

- About STL
- Challenge Statement
- High Level Solution Architecture
- The MATLAB advantage
- Other perspectives in the solution
  - Workflow Simulation
  - Solution Video
- Benefit KPI’s
- Q&A

We integrate digital networks for our customers

Core Business

Customer Segments

- Telcos
- Cloud Companies
- Citizen Networks
- Large Enterprises

End-to-End Solutions

Optical Connectivity	Fibre Deployment	FTTx Access Network	Network Modernisation
opticonn	LEAD 360°	FTTx mantra — One Solution. Countless Opportunities	netmode

Portfolio Offerings

Optical Interconnect Products	Virtualised Access Products	Network Software Products	System Integration Services

Unique Capabilities

Optical Interconnect Products	Virtualised Access Products	Network Software Products	System Integration Services
• Glass Preform • Optical Interconnect • Optical and Speciality Cables • Optical Fibre	• Programmable FTTx • Virtualised Radio • RAN Intelligent Controller • RAN Orchestration	• Telecom Billing Operations Software • Monetisation and Engagement Software	• Network Design Services • Fibre Rollout Services • Network O&M Services • Data Centre Integration • Private Enterprise Integration

STL in Numbers

$736 Mn.

FY20 REVENUE
India (66%), Europe (22%),
China (3%), Rest of world (9%)

7

GLOBAL PRODUCTION FACILITIES
50m fkm optical fibre capacity

GLOBAL FOOTPRINT

MANUFACTURING UNITS

SALES OFFICES

4

INNOVATION CENTRES
Research & Development

376

PATENTS
Across the network layer

Zero

WASTE TO LANDFILL
Shendra, Rakholi, Dadra

30+

NATIONALITIES
~3,100 Employees

CSR initiatives and its impact

Environment | Social | Governance

Caring for the environment

8k
trees saved

5.3k
MT CO2 reduced

5R
Approach – Recycle, Resuse, Reduce, Refuse, Remove

Enabling millions

1.32M
lives impacted

Our Initiatives

Education : Smart Nandghars, Digital Empowerment

Health : Mobile Medical Unit

Environment : Jaldoot, Greenbelt

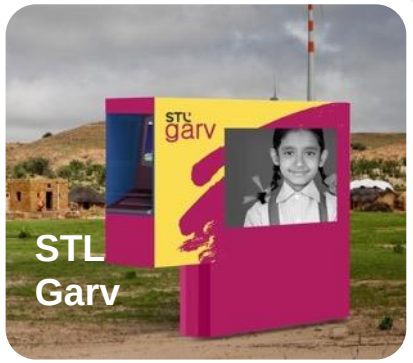
Empowerment : Jeevan Jyoti

Driving Sustainability

65k
tons diverted from landfill spaces

96%
of our industrial waste does not go into landfill

Reduced
CO2 emissions significantly



Innovating for good

Transform
rural India (Pilot across 3 states) for digital readiness

Results
27% increase in internet usage

76.2% women using supplementary education

50% more usage of Govt. Apps

8.7 average user rating

Skilling for a better future

72k
Trained Professionals

10K
Certified Professions

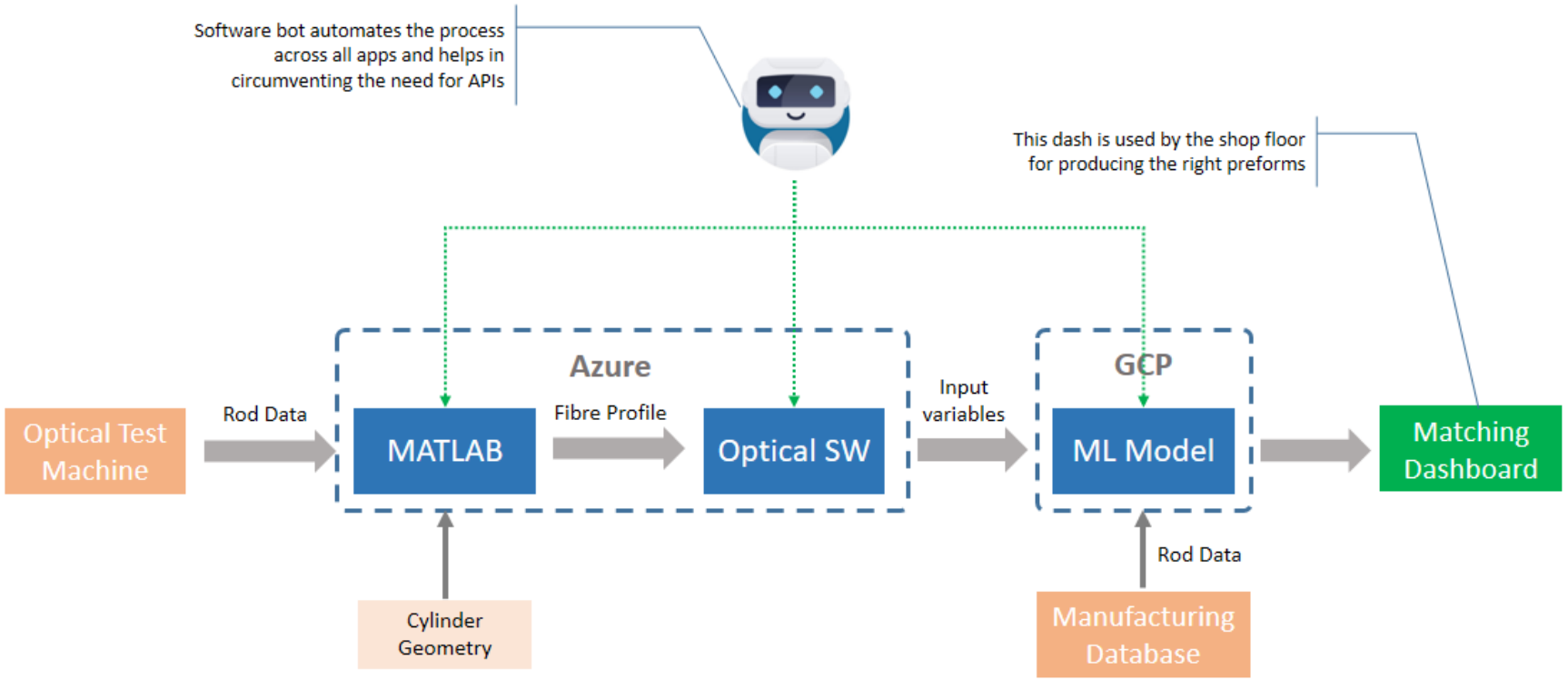
Academy
training for deployment of future ready networks

Challenge Statement

- Optical Fiber Manufacturing is a driven by precision technology
- Geographical spread of manufacturing locations & associated logistics adds complexity
- End to end process (from RM to FG) takes about 20 days
- Feedback loop from E2E process is not the right mechanism to control costs or scrap
- All scrap adds to the cost of manufacturing

How to accurately predict the manufacturing parameters to control scrap is a huge challenge

High Level Solution Architecture



The MATLAB Advantage – Fiber profiling

- Input: Glass Rod Parameters from Optical testing machines
- Operation: Calculate theoretical profile using geometric properties of Glass Rod & Cylinder
- Output: Scrap rate of theoretical profile

Prediction tool : Why MATLAB

Manufacturing process involves combining the outputs from several process for making an end product

Virtual Experimentation :

- Combine all process out parameters coming from various machines
- Generate a virtual finished good and predict output performance

Ease of use

- To solve complex electromagnetic equations MATLAB provides symbolic math tool box and also provides algorithms for solving differential equations
- Can develop indigenous codes as per internal process
- Data processing capabilities

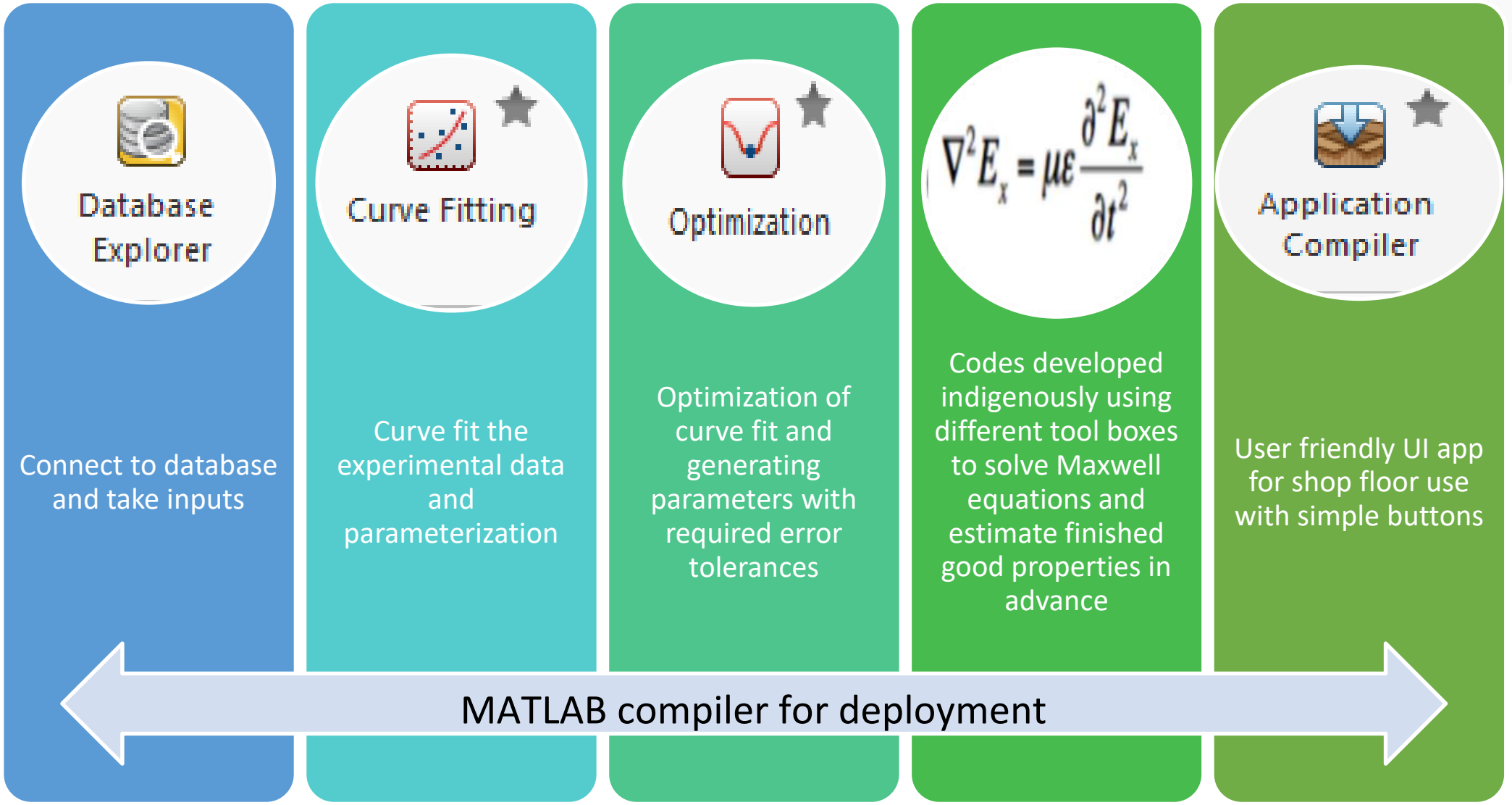
Automation

- Interact with variety of external software's with easy integration

Keep it simple

- User friendly UI can be deployed on shop floor
- Can be deployed and distributed the UI apps using compiler provided by the MATLAB

Process flow : MATLAB prediction tool



Workflow Simulation

Total run time ~ 5 hours (buffer included)

Transaction #1

Cylinder WIP View (BQ Table)

#	Cylinder ID	Data	Allotted
1	C1		No
2	C2		No
.	.		No
.	.		No
.	.		No
29	C29		No
30	C30		No

Rod WIP View (BQ Table)

#	Cylinder ID	Data	Allotted
1	R1		No
2	R2		No
.	.		No
.	.		No
.	.		No
.	.		No
.	.		No
.	.		No
.	.		No
199	R199		No
200	R200		No

Run time
MATLAB = 30 sec
Optifiber = 50 secs

Batch Run time (for 200 pairs)
MATLAB = 100 mins
Optifiber = 166 mins
Total = 4.4 hours

Bot Output

#	Cylinder ID	Rod ID	ZD	MFD	Cutoff
1	C1	R1			
2	C1	R2			
.	C1	.			
.	C1	.			
.	C1	.			
.	C1	.			
.	C1	.			
.	C1	.			
.	C1	.			
199	C1	R199			
200	C1	R200			

ML Model

45 secs run time

Rod R1,R2, R5, R50, R200 allotted to C1 (say 5 rods alllotted)

Transaction #2

Cylinder WIP View (BQ Table)

#	Cylinder ID	Data	Allotted
1	C1		Yes
2	C2		No
.	.		No
.	.		No
.	.		No
29	C29		No
30	C30		No

Rod WIP View (BQ Table)

#	Cylinder ID	Data	Allotted
1	R1		Yes
2	R2		Yes
.	.		No
.	.		Yes
.	.		No
.	.		No
200	R200		Yes
.	.		No
.	.		No
235	R235		No
236	R236		No

Run time
MATLAB = 30 sec
Optifiber = 50 secs

Batch Run time (for 231 pairs)
MATLAB = 115 mins
Optifiber = 192.5 mins
Total = 5.12 hours

Bot Output

#	Cylinder ID	Rod ID	ZD	MFD	Cutoff
1	C2	R1			
2	C2	R2			
.	C2	.			
.	C2	.			
.	C2	.			
199	C2	R199			
.	C2	.			
.	C2	.			
.	C2	.			
235	C2	R235			
200	C2	R236			

ML Model

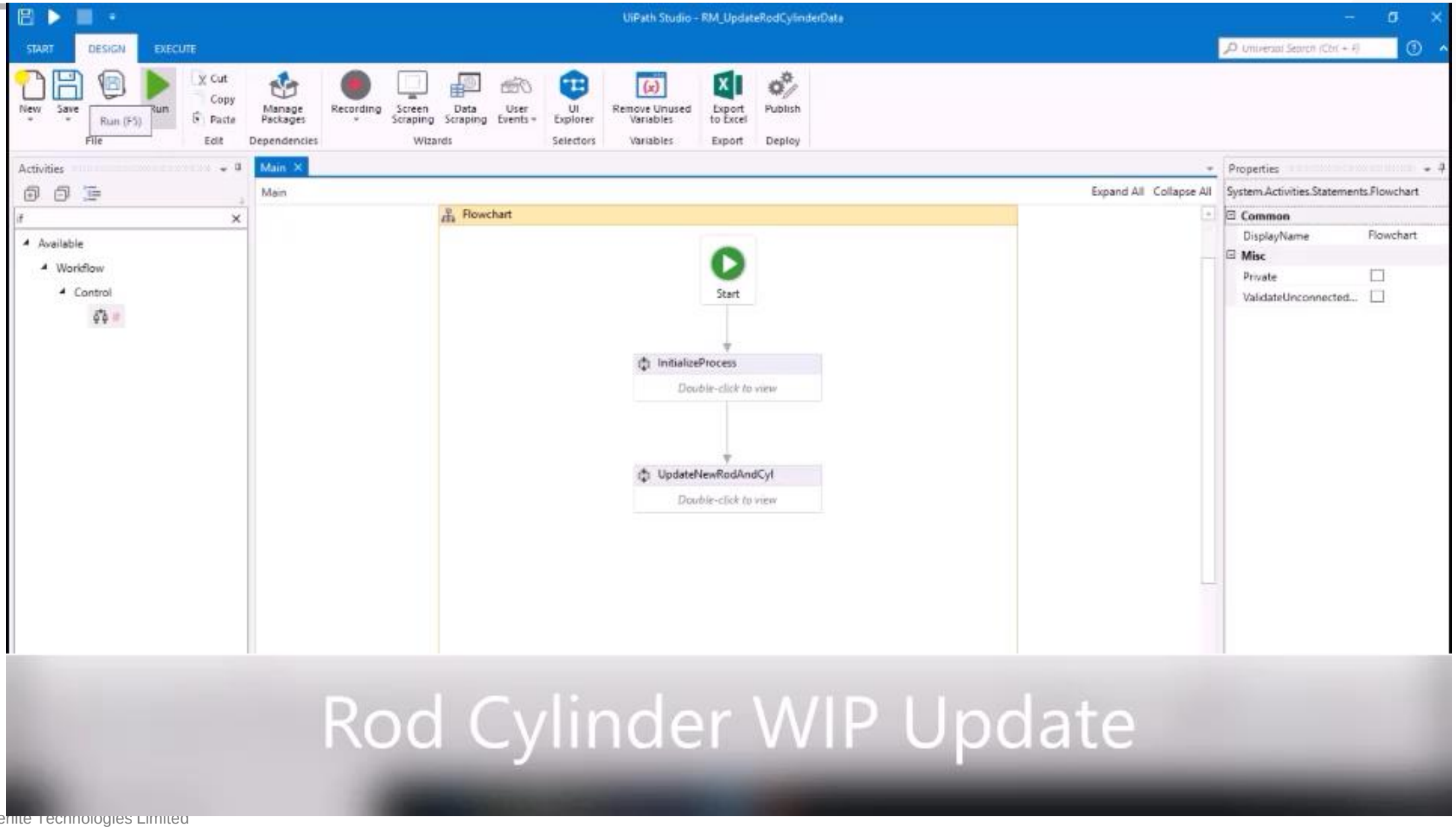
45 secs run time

Bot would be able to allocate rods to a cylinder every 6 hours.

Avg Dispatch Interval = 5 Hrs

6 rods are produced every hour on avg. For next run, 36 new rods would be added

Solution Video



Benefit KPI’s

- End to end Light weight App built for operators
- 24 X 7 Automated Runtime (14+ FTE avoidance)
- 8% reduction in FG costs with profiling data from MATLAB and ML matching

Q&A

For further questions please reach to

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