Fair Dynamics consulting

Flu pandemic supply
Modelling and simulation of shop-floor operations

London, October 14th, 2016

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Martino Grazzi, Product Leader – GSK
Luigi Manca, Partner – Fair Dynamics Consulting

THE COMPANIES:

- Fair Dynamics:
  - Milan based consulting firm, specialized in the study of complexity, that aims at providing answers through the simulation of business problems. From 2016 is part of the Engineering Group.
  - Worth noting costumers:

- Engineering:
  - Italian leader in Business Integration Consulting, Software and ICT services.

ENGINEERING

50 sites worldwide

877,5 Production value

45,5 Net income

8.100 professionals

+3.000 external resources

9% market share in Italy

1.000 large accounts in all markets

GSK

Pharmaceuticals

We develop and make medicines to treat a range of conditions including respiratory diseases and HIV/AIDS

2bn

packs of medicines in 2015

Vaccines

We research and make vaccines for children and adults that protect against infectious diseases

690m

doses of vaccines in 2015

Consumer Healthcare

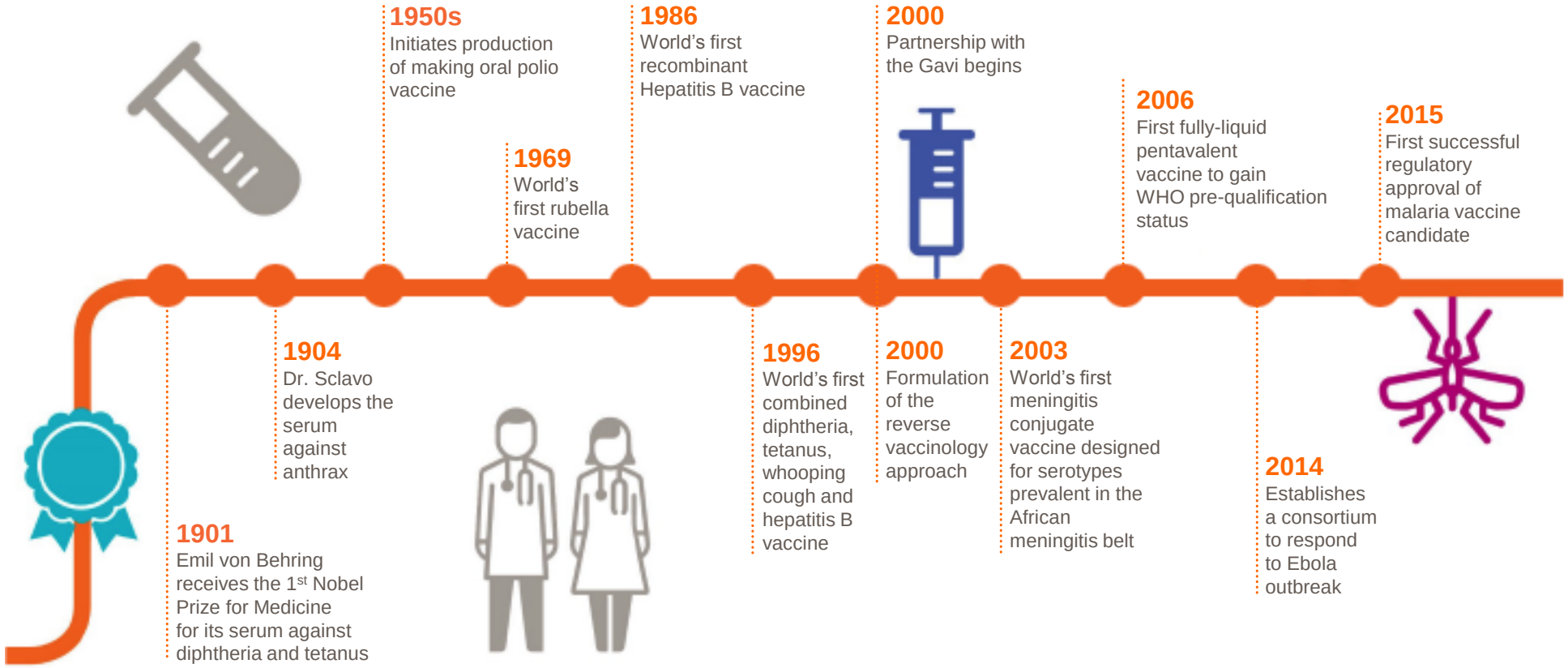
We make a range of consumer healthcare products in four categories: Wellness, Skin health, Oral health and Nutrition

N° 1

specialist oral care company in 2015

Source: GSK 2015 Annual Report and Responsible Business Supplement

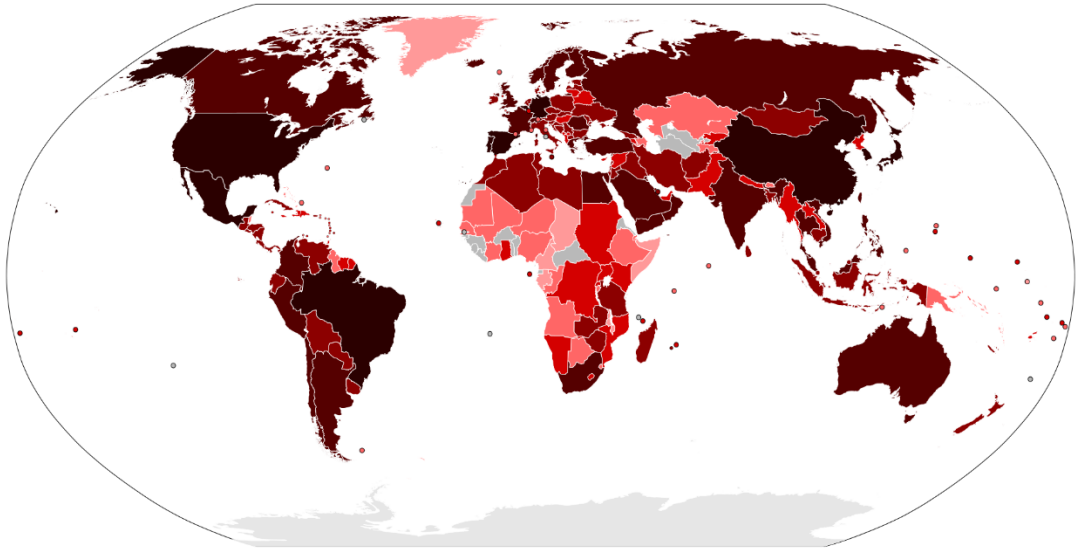
GSK VACCINES: A HISTORY OF INNOVATION



Source: GSK

GSK VACCINES: PLAYING A ROLE IN HEALTH EMERGENCIES

- As a leader in the manufacture flu vaccines GSK is committed to the society to be ready for a possible flu pandemic outbreak.
- Being ready translates into having plans to maximise the supply chain throughput, while minimizing flow time.
- Plans must be simulated in advance, in order to identify the capacity requirements at work centre level, incorporating the execution randomness.



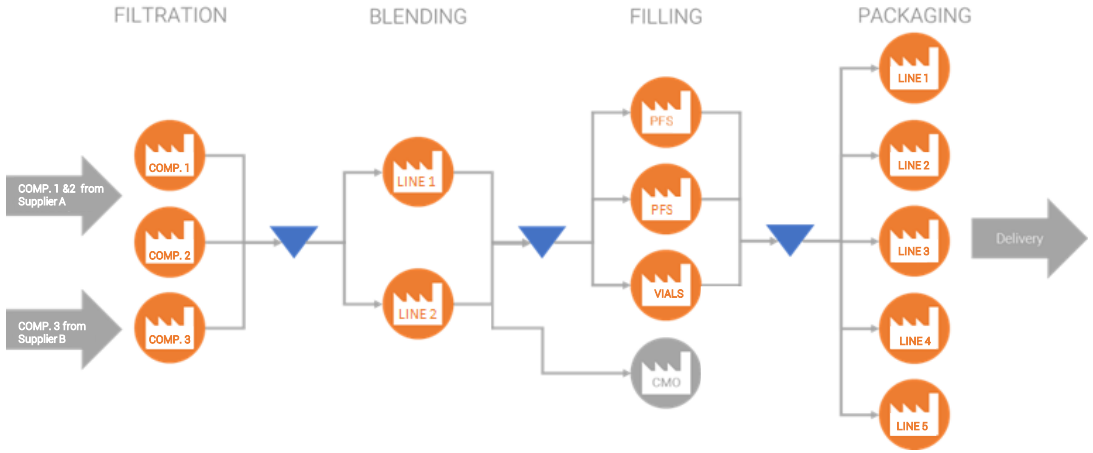
THE PROJECT: SCOPE AND OBJECTIVES

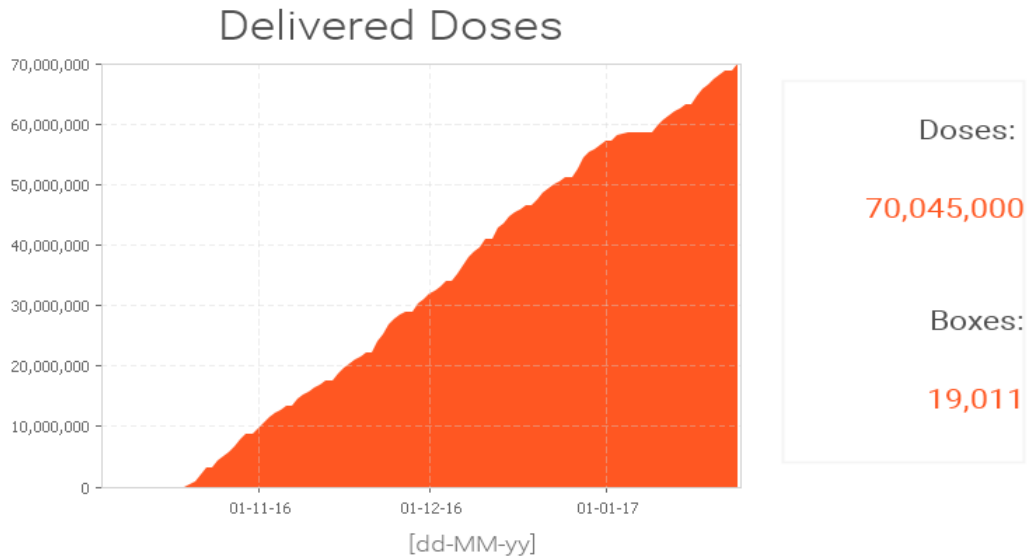
- Scope:

Secondary production (formulation, filling, packaging).

- Objective:

Identify the best configuration of all critical levers (internal or external) governing the supply chain system *to produce as many doses as possible in shortest possible timeframe*.





THE PROJECT: REQUIREMENTS

- Production processes have finite capacity.
- Different internal and external (CMOs) lines share a finite number of resources.
- Any equipment failure impacts on the deliverable vaccines doses.
- Ancillary equipment involved in the production processes need to be cleaned and sterilised. This process has also finite capacity.
- Each batch is subject to several controls before being released for distribution (QC, environmental monitoring, sterility).

THE PROJECT: METHOD

- The simulation model has been realized using an hybrid approach between Discrete Event and Agent Based Modelling and Simulation.

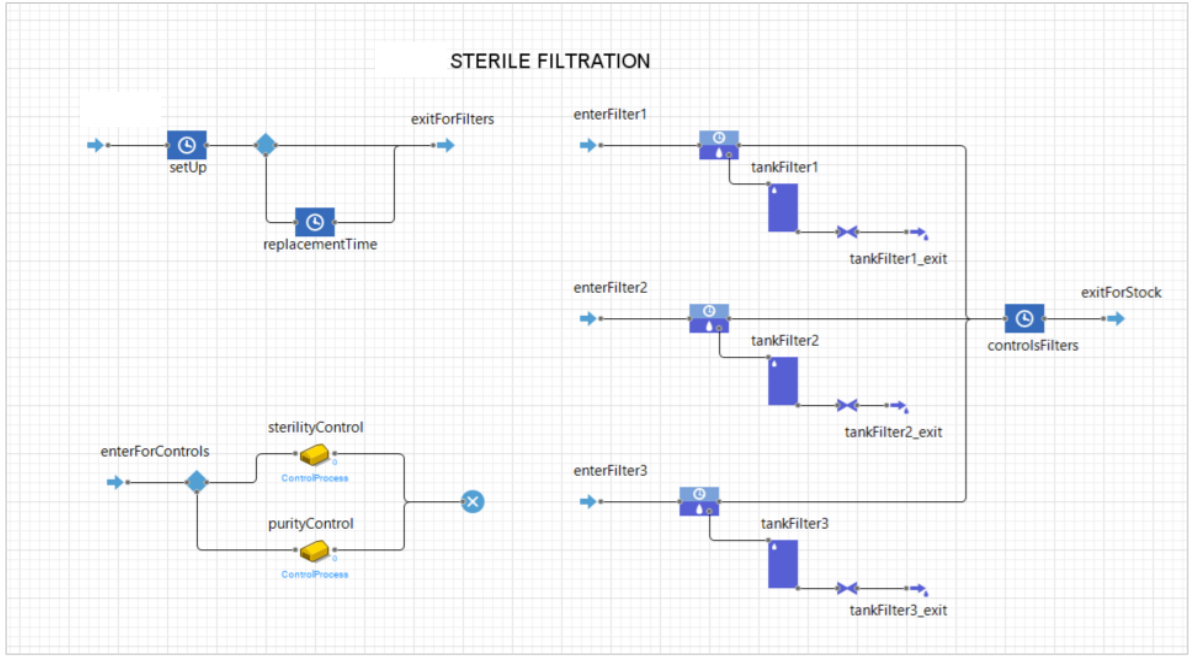
  - Supply Chain Production Steps and the inventories have been modelled through a Discrete Event approach:
    1. Processes are detailed in their different steps (low level of abstraction).
    2. The movement of the batches inside the whole supply chain is accurately reproduced.

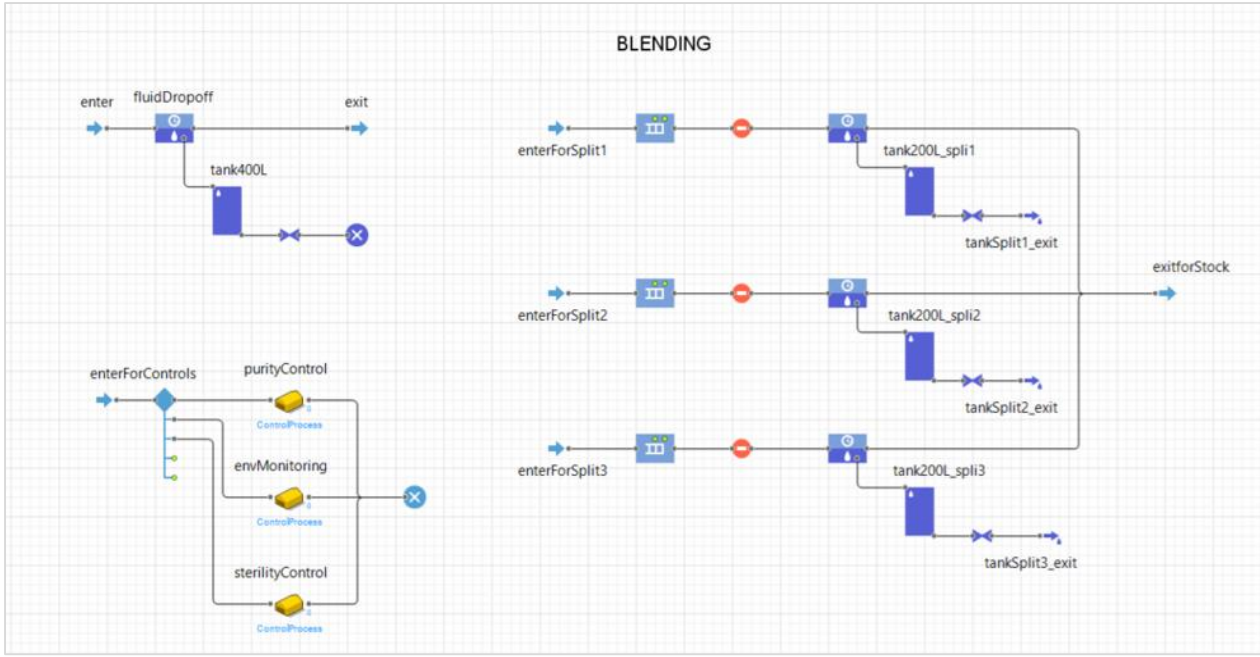
  - The activities of cleaning and sterilization of the ancillary equipment, along with the shared resources, have been modelled through an Agent Based approach:
    1. Capability to embed managing rules inside the agents. E.g. Capability of handling different resources taking into account priorities or other system's constraints.
    2. Capability to scan the entire process and schedule the production, step by step, considering the availability of resources.

INNOVATIVE FEATURES

1) Fluid Library

- Since the modelled supply chain deals with the production of liquid vaccine, the Fluid Library proved to be the best choice for reproducing the behaviour of the vaccine bulk, reducing the assumption about timing and batching (filling containers, mixing semifinished products etc.).



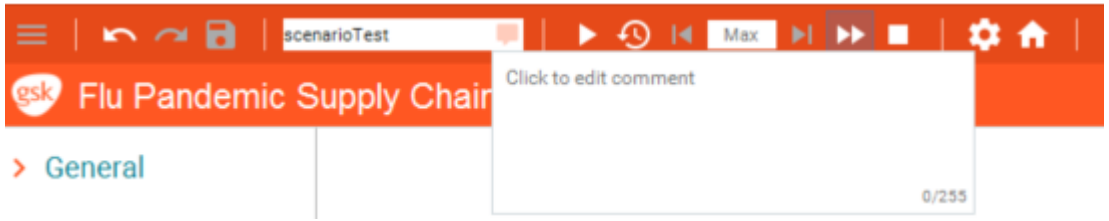


INNOVATIVE FEATURES

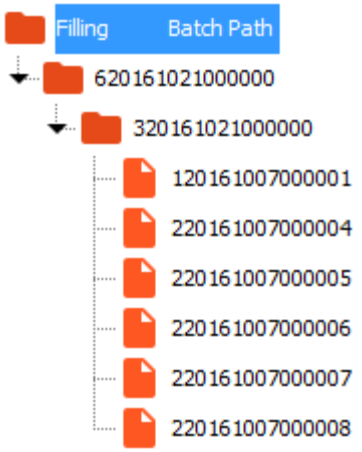
2) Advanced User Interface

- Customized interface developed along with the customer.
- Simplified approach to simulation:
  1. Input: user can modify the input data for each parameter in an intuitive and easy way.
  2. Output: Thanks to easy to understand graphs, user can evaluate the effect of their policies by visualising the state of the system over time.
  3. Scenario management: User can easily handle (save, modify, create, delete) several scenarios.

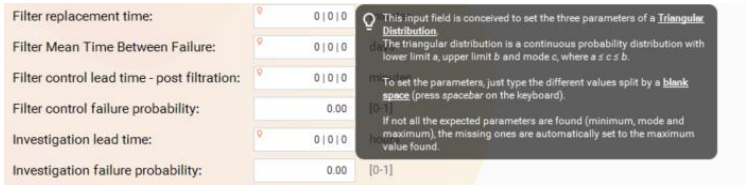
TOOLBAR



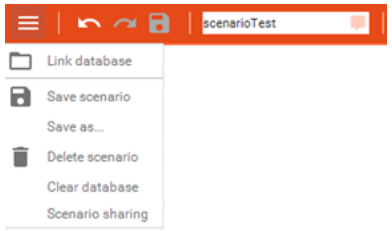
TREEMAP



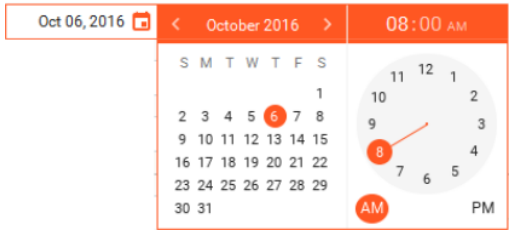
TOOLTIP HINTS



SCENARIO MANAGEMENT



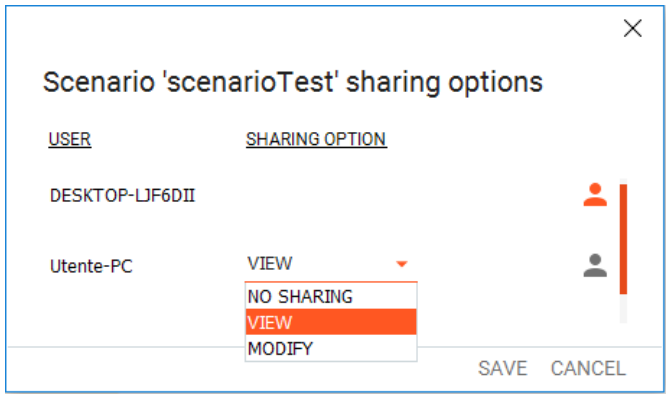
DATE PICKER

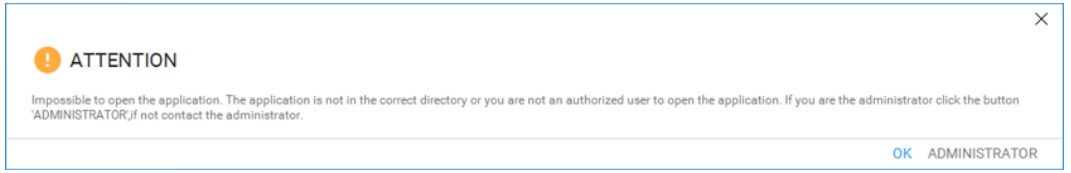


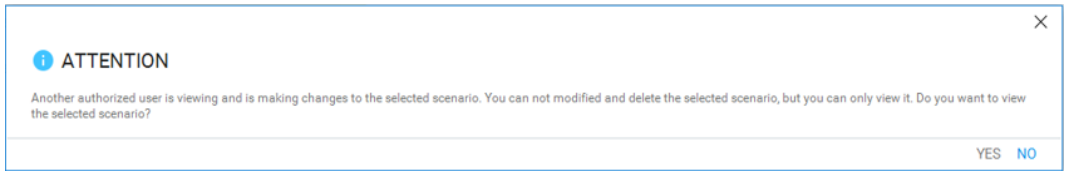
INNOVATIVE FEATURES

3) Embedded Java Database

- Scenario management capabilities.
- High Speed in reading and writing data.
- Security of sensible data:
  1. Database is locked and openable only through the Pandemic application.
  2. Database is opening only if it is located in a specific directory.
  3. Using Database requires administrator authorization or users need to belong to a specific security list.
  4. Authorized personnel, who have generated a scenario, can set if other authorized people can modify or only view this scenario.
  5. When two people are working at the same time on the same scenario, only the first person who opened it can also modify it. With this solution the consistency of data are guaranteed. It is not possible overwriting the database concurrently.







CONCLUDING REMARKS

CUSTOMER PERSPECTIVE

- Management can benefit from a tool that **provides an overview** of the entire system, giving quantitative support to the decision making phase.
- Possibility to **test different** scenarios with a certain **combination** of levers from **different perspective** (i.e. Production, Quality, Logistics, Sales…).
- Possibility to identify the **best planning strategies** in fast changing settings.
- Queueing network model with dynamic identification of shifting bottlenecks.
- High security for sensitive data and reliable results.

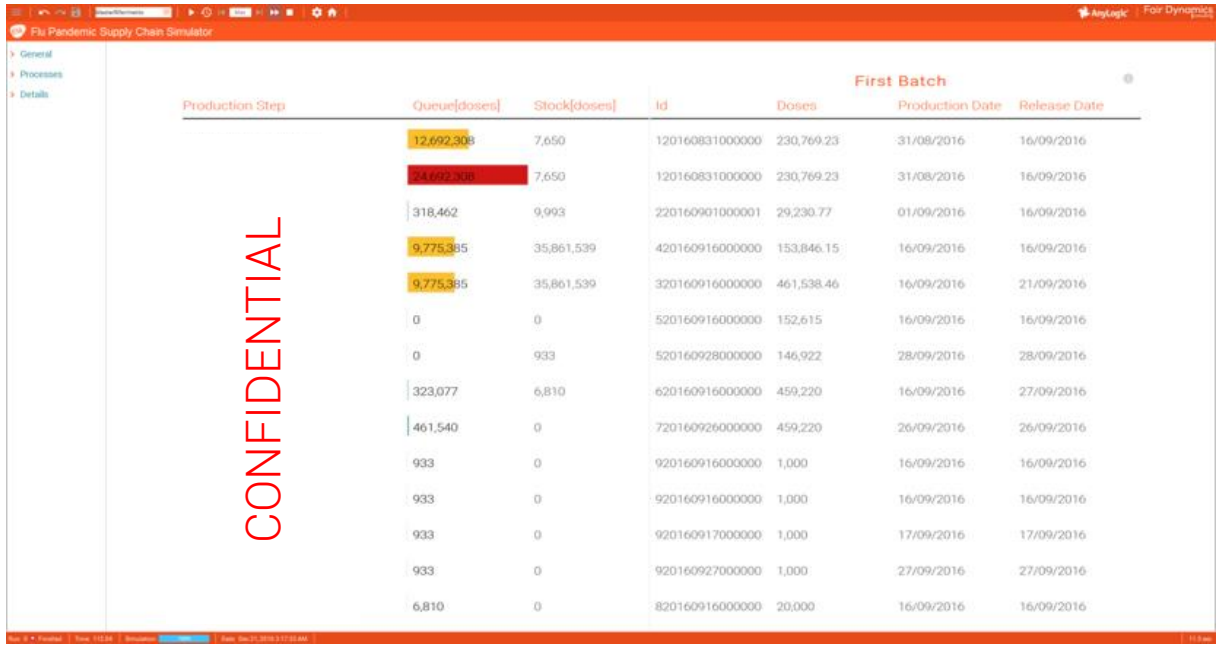
FAIR DYNAMICS PERSPECTIVE

- New solution to a vaccine supply chain problem, thanks to the fluid library.
- Improving of the user experience through an intuitive interface, that has dramatically reduced the effort required from the customer to approach simulation.
- Improvement of the proprietary reusable library of graphical elements.

MODEL OUTPUT

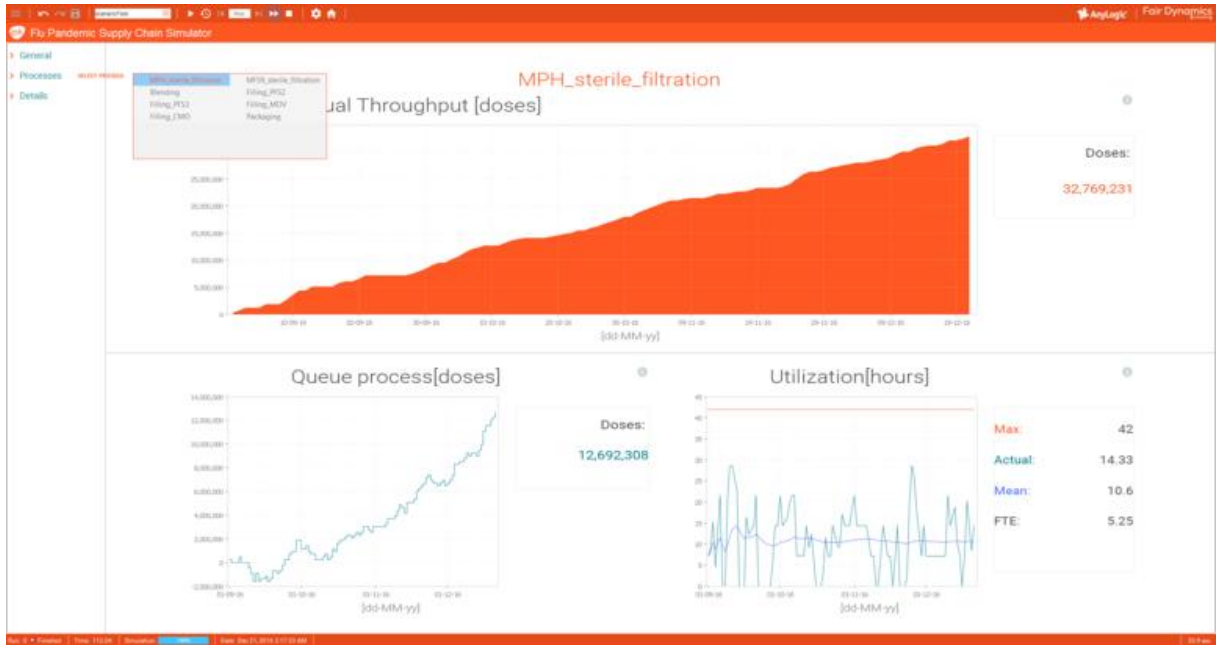
GENERAL OVERVIEW

QUEUES DETAILS

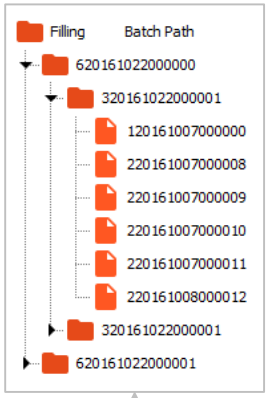


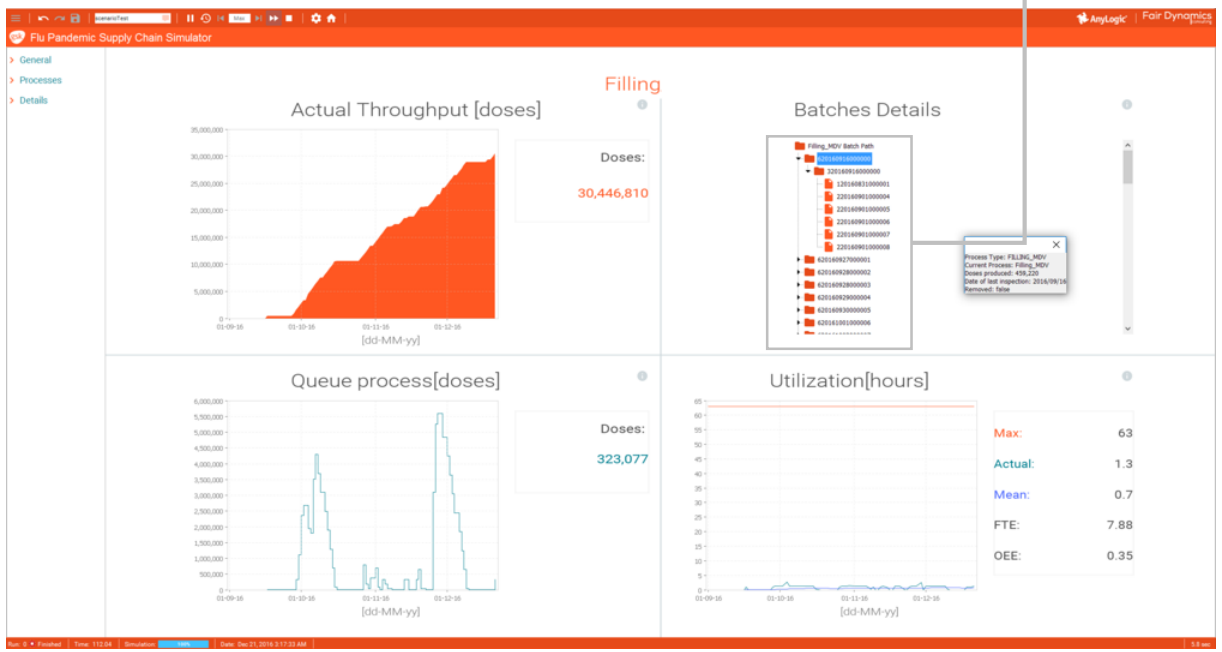
MODEL OUTPUT

FOCUS ON SINGLE STEP



TREEMAP: BATCH DETAILS





Q&A

- Thank you for your time today

- Further information available on:
  - www.fairdynamics.com