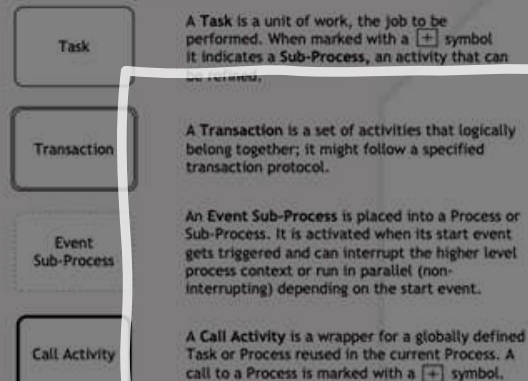




Activities



Activity Markers

Markers indicate execution behavior of activities:

-  Sub-Process Marker
-  Loop Marker
-  Parallel Marker
-  Sequential Marker
-  Ad Hoc Marker
-  Compensation Marker

Task Types

Types specify the nature of the action to be performed:

-  Send Task
-  Receive Task
-  User Task
-  Manual Task
-  Business Rule Task
-  Service Task
-  Script Task

Sequence Flow

defines the execution order of activities.

Default Flow






is the default branch to be chosen if all other conditions evaluate to false.

Conditional Flow

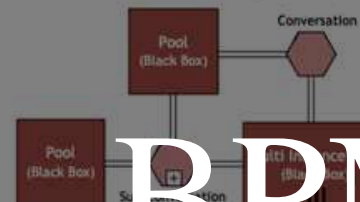
has a condition assigned that defines whether or not the flow is used.

-Likhith Anand
(3823028)

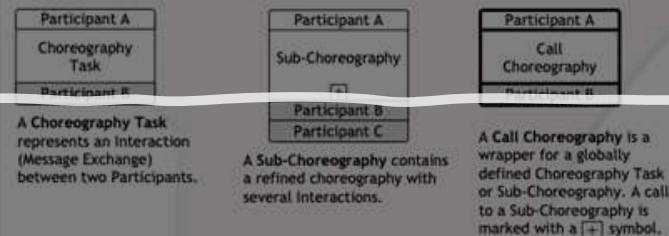
Conversations

-  A Conversation defines a set of logically related message exchanges. When marked with a  symbol it indicates a Sub-Conversation, a conversation within a conversation.
-  A Call Conversation is a wrapper for a globally defined Conversation or Sub-Conversation. A call to a Sub-conversation is marked with a  symbol.
-  A Conversation Link connects Conversations and Participants.

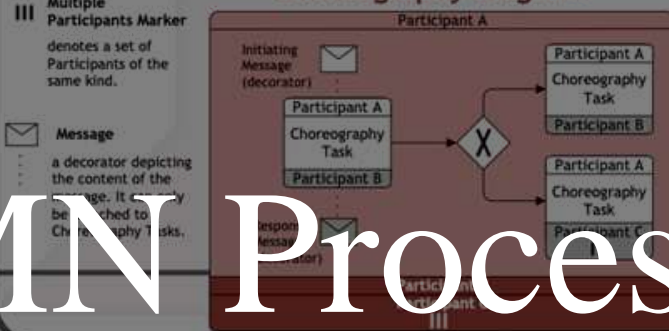
Conversation Diagram



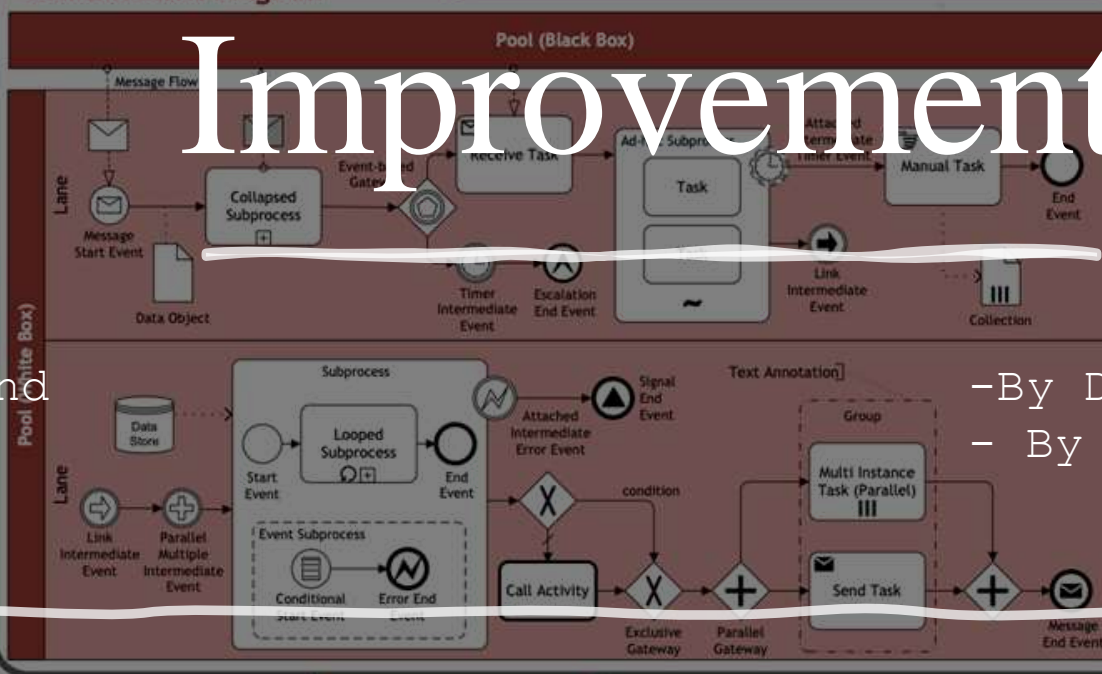
Choreographies

















































































Choreography Diagram



Collaboration Diagram






Events

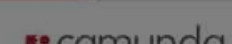
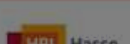
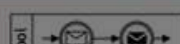
	Start	Start	Start	Intermediate	Intermediate	End
	Standard	Event Sub-Process Interrupting	Event Sub-Process Non-Interrupting	Catching	Boundary Interrupting	Non-Interrupting
None: Untyped events, indicate start point, state changes or final states.						
Message: Receiving and sending messages.						
Timer: Cyclic timer events, points in time, time spans or timeouts.						
Escalation: Escalating to an higher level of responsibility.						
Conditional: Reacting to changed business conditions or integrating business rules.						
Link: Off-page connectors. Two corresponding link events equal a sequence flow.						
Error: Catching or throwing named errors.						
Cancel: Reacting to cancelled transactions or triggering cancellation.						
Compensation: Handling or triggering compensation.						
Signal: Signalling across different processes. A signal thrown can be caught multiple times.						
Multiple: Catching one out of a set of events. Throwing all events defined.						
Parallel Multiple: Catching all out of a set of parallel events.						
Terminate: Triggering the immediate termination of a process.						

-By Decrease in Scrape Rate
- By Increase in Energy Efficiency

Data

-  A Data Object represents information flowing through the process, such as business documents, e-mails, or letters.
-  A Collection Data Object represents a collection of information, e.g., a list of order items.
-  A Data Input is an external input for the entire process. A kind of input parameter.

Swimlanes





1. Improving Mixing Consistency

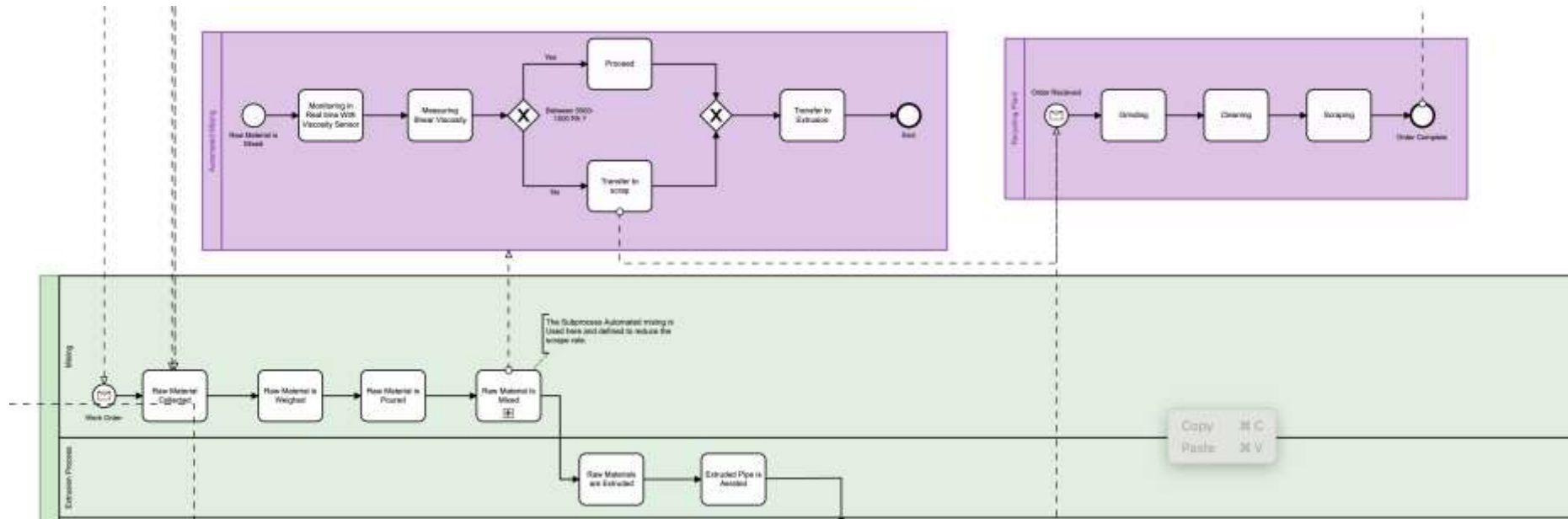
(Decreases Scrap Rate)

- **Current Problem-**

- Inconsistent blending of HDPE resin, color masterbatch, and additives can cause variations in pipe properties (e.g., strength, color uniformity, and durability).
-

- **Solution-**

- **Standardize Raw Material Ratios:** Define precise recipes (e.g., using a gravimetric dosing system) to ensure uniform proportions of resin and additives.
- **Automated Mixing Control:** Equip mixers with PLCs (Programmable Logic Controllers) or digital controllers to maintain consistent mixing speed, temperature, and time.
- **Quality Checks Before Extrusion:** Use in-line spectrophotometers or sampling tests to confirm color and composition before moving to extrusion.



IMPROVEMENT PROCESS FOR BPMN SCHEMA -

• BPMN Integration-

- **Add a Subprocess** for "Automated Mixing" with System for real-time ratio adjustments.
- **Insert a Quality Check Task** (Shear viscosity) before sending the mixture to extrusion.
- **Conditional Gateway** to either proceed if within spec or return to re-mixing if not.
- **I have integrated the process improvement into my BPMN schema as follows.**

2. Optimizing Cooling Efficiency

(Decreases Energy efficiency)

•Current Problem –

Overcooling, inconsistent cooling, or excessive water usage can increase operational costs and slow down production. Inconsistent cooling can also lead to warping or dimensional inaccuracies in the final pipe.

•Solution-

- **Closed-Loop Water System:** Recycle cooling water to reduce costs and environmental impact.
- **Smart Temperature Control:** Install sensors to measure both water and pipe surface temperatures; use data to modulate flow rates and temperatures in real-time.
- **Zoned Cooling Tanks:** Segment the cooling bath into zones, each with different temperature settings, to match the thermal profile needed as the pipe moves downstream.



IMPROVEMENT PROCESS FOR BPMN SCHEMA -

- **BPMN Integration-**

- **Cooling Subprocess** that includes sensor-based monitoring tasks.
- **Decision Gateways** to adjust flow or temperature based on sensor data.
- **Feedback Loop** to continuously refine cooling parameters and maintain optimal conditions.

• I have integrated the process improvement into my BPMN schema as follows.

