ADHESIVE TECHNOLOGIES #INNOVATION IMPACT PROGRAM 2024

Case Study **Data Scientist**

"Accelerating Adhesive Development: Leveraging Digital Tools and Data Analysis"

Henkel

PRESENTATION BRIEF
BACKGROUND (1/2) – ACCELERATING ADHESIVE DEVELOPMENT

- You are a data scientist within Adhesive Technologies. You are part of a larger team with experts in technology who work in remote countries. You have access to a local team who can conduct lab work based on your findings and recommendations.

- You and your peers report to Patricia Conner, the technology lead in this segment. Having started just a few months ago at Henkel, your knowledge about Henkel's products is still developing.

- It is Monday morning, and you have just arrived at work when you see an email from Patricia's boss, Jennifer Brown, the Global Innovation Head.

Henkel

PRESENTATION BRIEF
BACKGROUND (2/2) – ACCELERATING ADHESIVE DEVELOPMENT

Dear XXX,

We are facing a critical project with a tight timeline in identifying best formulation of an adhesive that has an improved fiber-tear than the existing formulation, for the application of packaging. To secure a major customer acquisition, we need to shorten this product development cycle from six to three months. This accelerated timeline requires us to identify potential tools to speed up the development process. Two different types of fibers used in the substrate materials are fiber type #1 and #2. You have access to a dataset of existing adhesive formulations that need to be optimized to meet specific customer requirements as below:

1. *Fast load should be maintained above 4.25.*
2. *It is important to maintain this fast load above 4 during aging test.*
3. *Optimizing fast load is of lower priority compared to the slow load.*
4. *Fiber-tear should be 100% with a possibility to drop by 20% after 1000hrs.*

Your task is to analyze the given dataset, identify gaps, and optimize the data to suggest the next set of experiments. Please, plan how we can create an optimized design of experiments to efficiently utilize our limited resources.

In your strategy, please, propose what digital tools (such as data analytics platforms, predictive modeling techniques, and machine learning algorithms) can be used to support such an analysis and accelerate the development process. You will coordinate with the local lab team to conduct the necessary experiments, with specific limitations for lab work to be provided separately in supporting information.

Feedback on potential challenges and how they can be mitigated is needed from your side. Please, prepare a short presentation (10 min) on your strategy for analyzing the dataset, identifying data gaps, planning necessary experiments, and utilizing digital tools. We also ask you to include a plan for the potential resources needed to execute this strategy. Please, be ready to discuss your approach at our alignment meeting tomorrow.

Best regards,
Jennifer

Henkel

PRESENTATION BRIEF
SUPPORTIVE INFORMATION 1/2 – ACCELERATING ADHESIVE DEVELOPMENT

Experimental Constraints and Considerations:

- Up to 5 experiments can be conducted each Monday.

- There is potential to increase the number of experiments, but this requires strong proof of high-value acquisition.

- Each experiment requires roughly 2 days for formulation production and 3 days for curing.

- Additional time is necessary for testing the formulations to ensure they meet the desired properties.

- Testing time for some properties, such as product shelf life, could extend up to six weeks.

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PRESENTATION BRIEF
SUPPORTIVE INFORMATION 2/2 - ACCELERATING ADHESIVE DEVELOPMENT

Experimental Requirements:

✓ We need to achieve the following properties: Fiber-tear, Fast and slow load.

✓ It is assumed that only components A, B, C, and D influence these properties.

✓ Process parameters also cause variation in the impact of these components on the properties.

Key Deliverables:

✓ Your insights on the dataset.

✓ Description on your approach to the solution, including the selected techniques, along with reasons and limitations.

✓ Findings from the analysis and how to communicate these results to colleagues in the chemistry lab.

✓ Suggestions for successful formulation strategies to address the challenges and save project time.

Henkel