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2021 extern at Rosenboom - Sheldon

## Part I: Overview of Workplace

Rosenboom is a family owned company that specializes in making custom hydraulic cylinders. Founded in 1974, Rosenboom has grown from a Tool & Die shop in a garage to a worldwide cylinder company with 3 domestic location and 1 in China. Rosenboom hydraulic cylinders can be found in farm machinery, material handling, military, fire & rescue and many other industries.

## Part II: Workplace Focus

Metal Finishing is where chrome and cobalt plating take place. This is critical to the strength of the rod in the cylinder. Titrations are used to test the concentration of chromic acid in the plating solution. The results from the titration are put into a data sheet and then a graph is made to track how the solution is changing as the plating process occurs.

## Part III: Introduce the Problem

Because of the process of chrome plating is a potentially toxic process, we will not be able to replicate what it is that I exactly did at Rosenboom. We will be changing the elements used as well as the plating solution. Students will be put into a situation where they are given different metals and they will begin by researching their atomic structures and general properties. Next, students will be observing those metals when they are put through a series of chemical reactions to observe and collect data. Finally, students will be seeing how the metals react to changes when thermal energy is added or removed. Once students have mastered all of these beginning steps, they are going to be asked to figure out how to combine the best characteristics of those two metals to make a piece of rescue equipment that is more heat resistant than the current piece. The finished product will be a piece of metal that is coated in another metal, giving it the desired properties (temp. resistant). With the finished product in hand, students will have to make a presentation that is presented to the host as to why they should receive business.

## Part IV: Standards, Driving and Essential Questions

This PBL Unit could cover NGSS standards MS-PS1-1, 1-2, and 1-4. The driving question for this PBL is: "How can we as chemists create an effective way to combine the characteristics of metals in order to create a heat resistant fire rescue tool?" A few of the essential questions addressed during this PBL are: "What evidence can show how the physical and chemical properties of the substances change?" "How can particles combine to produce a substance with different properties? How does thermal energy affect particles?" Students will be looking at the properties and structures of metals in order to solve the problem. Throughout the process of this PBL, students will be creating many different models. They will first create models of the individual structures of atoms, and then simple molecules. Students will be completing a lab on chemical changes to identify signs of chemical changes, then also analyze data from the lab.

## Part V: Extern Host Role

The teacher would be the person that is giving students their metals that are used and the parameters that need to be followed for making this heat resistant tool. Employees from Rosenboom would be acting as teaching/learning partners where the students are able to reach out to Rosenboom employees for assistance. The host would also be a part of this PBL to explain the uses for the different combinations of materials as well as how and where they are used in the world outside of school. Providing examples of the where the different types of plated material is used would be beneficial to students. A tour of the facilities in Sheldon would also be a great chance for students to see the large scale operations of Rosenboom. Employees that would be beneficial to the implementation of this PBL are as follows: **Angie Johnson** (Training and Development Coordinator) - **Andrew Moline** (Director of Metal Finishing) - **Max Moline** (Lab Tech.) - **Spencer Thein** (Quality Assurance Specialist)

## Part VI: Student Learning

Students will be choosing how they want to share their final product. Students will have to give some sort of presentation of how they completed the project and explain the processes they went through. During the PBL, students will be working in groups. Within these groups, there will be teams of managers, designers/engineers, production, and advertising and marketing teams. All of the student teams will need to work together and communicate during the PBL so they have a cohesive final product & presentation. Student groups will also take time to meet with other groups to receive feedback on their overall processes and presentation materials. Students will also reflect on their learning and critique their own work during this time. During the reflection time, students will be comparing the models of atoms & molecules with in class atomic diagrams. The purpose of this reflection is to assess the understanding of atomic structures of both atoms and molecules. Students will also be reflecting on the interpretation of data from the chemical change lab. The purpose of this reflection is to check understanding of the difference between physical and chemical changes.