PENN STATE CHEMICAL ENGINEERING
VIDEO PROJECT

KEY INFORMATION AND EXAMPLE FOR ALUMNI VOLUNTEERS

Penn State Chemical Engineering Alumni Group
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A. Chemical Engineering Video Project Objectives and Expectations

Project Objective: Create a video library of Chemical Engineering alumni professional experiences, which reinforce and support key ChE curricula concepts and practices being taught to ChE students. The videos support and augment a much broader objective of alumni support through in person presence in class activities, and other initiatives.

Project Description: In the current Chemical Engineering curriculum many concepts, principles and practices are taught. Many of these may appear abstract to students and not be clear how they apply to real world chemical engineering. This PSChEAG project's objective is to create a video library of ChE alumni professional experiences, which reinforce and support key ChE curricula concepts and practices being taught to ChE students. The series of short videos would demonstrate how the various concepts are used and how they are of value to ChEs in the professional world. Instructors could use the videos in class to illustrate the importance of a new concept, or they could assign the videos as pre-class viewing to motivate students to material to be introduced in class. The videos support and augment a much broader objective of alumni support through in person presence in class activities, and other initiatives. We anticipate 8-10 initial short 2-5 minutes alumni videos. We plan to support a student videographer to edit the raw video footage and produce concise videos at low cost. This project is supported by a grant from the Penn State Engineering Alumni Society.

Expectations of ChE Alumni Video Volunteers: We appreciate your willingness to be a ChE video volunteer. As a volunteer, we have a few expectations of you:

- For your topic, you'll draft the video presentation following guidelines developed for this project.
- You'll make yourself available to the Video Team for discussions /telecoms/meetings regarding the video at mutually acceptable times, as needed.
- You probably will do the rough-cut video yourself (iPhone6 or equivalent) since you'll likely not make it to campus. The videographer will complete the finished copy.

- You'll redraft and reshoot the video based on feedback from the videographer, ChE Video team and a ChE faculty subject matter advisor.
- You'll use DropBox, Box or equivalent to transfer video files to PSU.
- You'll coordinate appropriate legal and proprietary approvals with your company, if necessary. You'll work with the Penn State ChE Video team to complete legal transfer of video ownership to Penn State.
- You should expect to commit about the same hours to complete the video project as you would a business technical presentation
- Although your expenses should be small, you'll be responsible for your personal costs and time.

B. Standard Outline of Video and Key Questions

We have developed a standard outline for the 2-5 minute ChE Videos and set of key questions to be answered during the video. We intend these to provide some consistency in format and quality of the various videos we'll develop.

Standard Outline:

Video target length is 2-5 minutes. The video time should be allocated as follows:

- 1/6 personal introduction
- 1/3 Introduce the ChE principle to be covered in a more general manner. Explain why this principle is critical to ChEs and how it is used in a broader sense
- 1/6 review the specific example to be discussed to orient the viewer to it
- 1/3 Discuss the specific example highlighting key aspects/steps of the subject matter principle of the video, and conclusion

Key Questions:

The following key questions should be addressed at some point in the video:

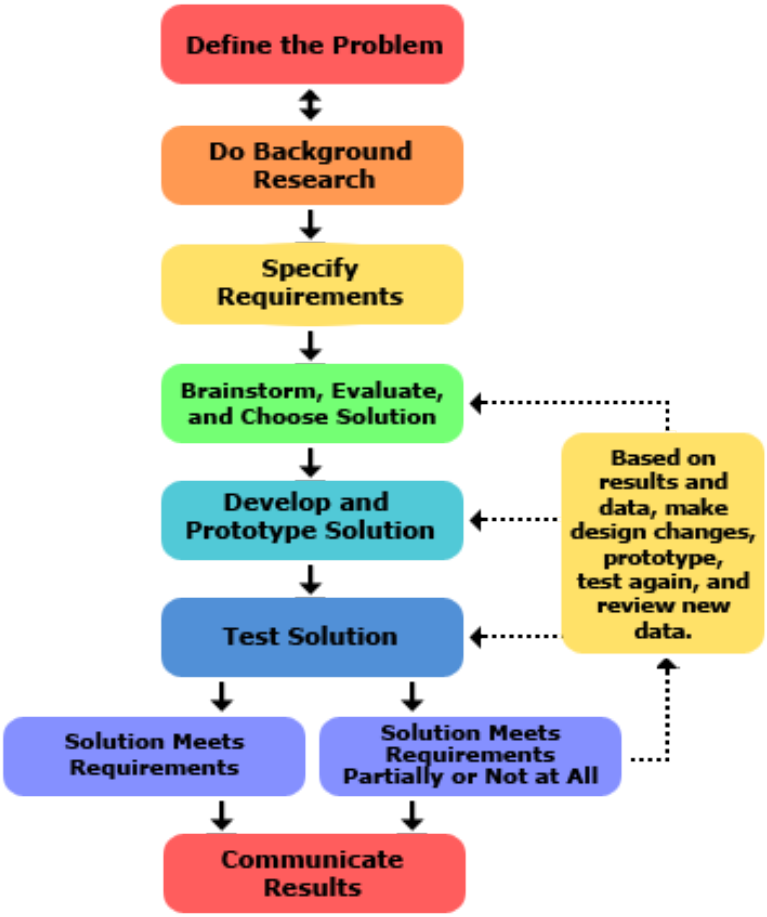
- What is the ChE principle discussed in this video?
- Why is this ChE principle important in the CPI?
- How do you use it in practice?
- What example will you show to demonstrate the use of this ChE principle?
- What was the outcome/value of this ChE principle to you and your organization?
- How else did you gain further knowledge and expertise on the topic beyond the ChE classroom?

C. Example Detailed Outline for Penn State ChE Pilot Video

Topic: Problem Solving
Example: Hot Oil Pump Chronic Mechanical Seal "Failures"

1) Personal Introduction
   a) Brad Sutliff
   b) PSU ChE Alum 2005
   c) Currently at Lonza, Williamsport PA Facility
   d) Maintenance Project Engineer

2) Topic: Problem Solving
   a) Most important general ChE skill
   b) Most of the time solving problems with processes or process equipment
   c) Several methodologies that exist, all very similar, check to see if your company has a specific methodology to follow
   d) Outside of the undergraduate curriculum training on problem solving methodology is often provided by you company or there are several continuing education professional classes offered as well
   e) General methodology example flowchart is as follows



   f) Summary of Problem Solving Steps

i) **Define the problem** – Brief statement of the issue and specifics of the problem. Also define criticality (i.e. safety, critical to maintain operation, is there a way to stabilize the problem for continued operations?)
ii) **Do background research** – Gather references on the process or equipment presenting the problem, talk to people at the plant with more experience, consult with experts
iii) **Specify requirements** – How should it be working? What's the goal?
iv) **Brainstorm, evaluate, and choose solution** – Identify what can be causing the problem. Involve the right people. Some of this information can come from the background research phase
v) **Develop and prototype solution** – Get solutions ready and determine how to implement
vi) **Test solution** – Implement and see if it works
vii) **Does solution meet, partially meet, or not meet requirements** – If requirements are met, move on to communication of results. If not this may require iteration as shown to any of the previous steps
viii) **Communicate results** – Develop a summary presentation of the entire problem solving project and present to key members at the plant so all are aware. This is a very important step. Keep all pertinent individuals in the loop. Good communication is key to success

3) Example: Hot Oil Pump Chronic Mechanical Seal "Failures"
   a) Process equipment problem to solve
   b) Quick overview of a mechanical seal and how it works
   c) Quick overview of hot oil system and its purpose as a heating utility
   d) Quick overview of what the pump does in the system
   e) Initially before this incident I knew absolutely nothing about these pumps. Often faced with the situation of learning something new for the first time in these problem solving situations

4) Step 1: Define the Problem
   a) Chronic mechanical seal failures for the hot oil boiler circulation pump
      i) Just installed a new leak detection system for the mechanical seal
      ii) Experienced 2 seal failures approximately 1 month duration between each failure
      iii) Failure leakage rate of 1 single drop of leakage every 5 – 10 minutes was identified
      iv) Problem is causing increased maintenance costs and production downtime. Critical to determine a resolution as this is a key process utility for the plant

5) Step 2: Do background research
   a) Obtain and review the IOM (Installation Operation and Maintenance) manual for the pump

b) Talk to maintenance and operation personnel about their experience with the equipment
c) Consult with the equipment manufacturers on the equipment. They build and design it so they should know how it should work

6) Step 3: Specify requirements
   a) Mechanical seals should last 3 – 5 years if properly specified for the application

7) Step 4: Brainstorm, evaluate and choose solution
   a) Show list of all possible root causes of the problem identified
   b) List of root causes was compiled from consultation with operations, maintenance, and equipment manufacturers
   c) Also sent mechanical seal to the seal manufacturer for evaluation to see if direct root cause can be identified
   d) All root causes identified were checked/implemented through the iteration process, only going to review the direct solution
   e) Interestingly enough it was determined the leakage rate of 1 drop every 5 – 10 minutes was normal for the seal. All mechanical seals leak at low rates based on the application. The new leak detection system identified something that actually always existed

8) Step 5: Develop and prototype solution
   a) Sized a collection reservoir to collect normal seal leakage that is drained on a preventive maintenance program every week

9) Step 6: Test solution
   a) Show pump and leak detection system and how it works
   b) Leak detection will also function properly in the event of a major seal failure that will trip the leak detection in only a few minutes for higher leakage rates for a standard seal failure situation

10) Step 7: Does solution meet, partially meet, or not meet requirements
   a) As discussed several solutions were checked and implemented, but the leak detection draining for normal leakage rate was the primary solution as a slow leakage rate is normal for this seal application per the seal manufacturer

11) Step 8: Communicate results
   a) For this project developed a summary presentation and reviewed with all key plant personnel

D. Final Pilot Video Example:

Please view the final sample video on problem solving here: https://youtu.be/OK-lW9i_Rmw?list=PL5FtUzdCyV-Sr7GOmrtaTsL18tSqJDAKC