Risk Assessment
Safety Plan

Project information:

High Speed Shaft Assembly System	02/28/19
Name of Project	Date of submission

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Faculty mentor	Phone Number	e-mail
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I. Project description:

Press pre-heated bearing sleeves onto shafts to create a shaft assembly that can be used in the TT series compressors for Danfoss Turbocor®. The layout of the workstation space should facilitate efficiency without compromising the safety of any Danfoss employees.

II. Describe the steps for your project:

General steps are as follows:

- Quickly remove pre-heated parts from the oven and place them on the press plate
- Quickly place a shaft into the pre-heated sleeve
- Operate the press to complete the shrink-fitting process
- Remove the assembly and place it on a cooling table

The steps above may be repeated for each pressing procedure

III. Given that many accidents result from an unexpected reaction or event, go back through the steps of the project and imagine what could go wrong to make what seems to be a safe and well-regulated process turn into one that could result in an accident. (See examples)

- Removing a part from the oven without the proper safety equipment could result in physical harm
- Moving any hot parts with another person in close proximity could result in physical harm to all parties present, as well as damage to equipment
- Moving anything into and out of the press should be done with caution, as the press can cause physical harm with improper use
- In the process of developing parts for the project, any machining should be done with caution, as there is inherent danger associated with the use of any tools

IV. Perform online research to identify any accidents that have occurred using your materials, equipment or process. State how you could avoid having this hazardous situation arise in your project.

Accidents that have occurred during the shaft assembly process include:

- The press operator could potentially burn or drop parts on oneself while transferring parts from the oven to the press.
- Improper alignment between the shaft and subassemblies could cause parts to rupture that could damage the press or the press operator.
- While the press is being used unwanted items on the press stage could cause damage to the press, parts, or the press operator

- Pre- Heated parts that are not hot enough could damage the parts or the press.
- Removing Assembled items from press too quickly could cause the assembly to fail.

V. For each identified hazard or "what if" situation noted above, describe one or more measures that will be taken to mitigate the hazard. (See examples of engineering controls, administrative controls, special work practices and PPE).

- Insulated gloves will be used to transfer heated parts.
- Steel toed boots and safety glasses are mandatory while in manufacturing area.
- The subassemblies will not be fully constrained during assembly to allow for some self-alignment
- A Plexiglas shield will be attached to the press in case parts rupture.
- Two hands must be used to operate the press and only one person can use the press at a time
- The oven will be placed close to the press and pre-heated parts should be immediately pressed once removed from the oven
- A standard time of 10 seconds will be allowed for the parts to shrink-fit in the press

VI. Rewrite the project steps to include all safety measures taken for each step or combination of steps. Be specific (don't just state "be careful").

General steps are as follows:

- Quickly remove pre-heated parts with the proper tools from the oven and place them on the press plate that has been machined for proper alignment.
- Quickly place a shaft into the pre-heated sleeve and allow for some self-alignment
- Once the press area is clear of unwanted items and no one else is in the workstation, operate the press to complete the shrink-fitting process
- When the temperature sensor shows the assembly has sufficiently cooled for a completed shrink fit, raise the press
- Remove the assembly with proper equipment and place it on a cooling table

VII. Thinking about the accidents that have occurred or that you have identified as a risk, describe emergency response procedures to use.

- If more than one person is in workstation while operating or unsafe conditions are noticed, stop work and notify the press operator or department representatives
- If injured seek medical attention immediately.
- If parts or the press are damaged, stop work and contact a department representative before using the press again.

VIII. List emergency response contact information:

- Call 911 for injuries, fires or other emergency situations
- Call your department representative to report a facility concern

Name	Phone Number	Faculty or other COE emergency contact	Phone Number
Mohammed Ajalal	850-728-4644	Dr. Patrick Hollis	850-410-6319

IX. Safety review signatures

- Faculty Review update (required for project changes and as specified by faculty mentor)
- Updated safety reviews should occur for the following reasons:
  1. Faculty requires second review by this date:
  2. Faculty requires discussion and possibly a new safety review BEFORE proceeding with step(s)
  3. An accident or unexpected event has occurred (these must be reported to the faculty, who will decide if a new safety review should be performed.
  4. Changes have been made to the project.

Team Member	Date	Faculty mentor	Date

Report all accidents and near misses to faculty mentor.