**Scenario-Based Questionnaire: A Case Study of the Drilling-Reaming process**

**Definition of Hole Specification and Process Scenario Parameters**

The hole specification and machining parameters define the functional requirements of the machined feature and the baseline operating conditions used to construct the scenario-based questionnaire and training dataset for the SimuDec framework.

Hole Specification:

- Hole Dimension = Ø10 x 30 mm
- Diameter tolerance = ±0.01 mm
- Depth tolerance = ±0.05 mm
- Roundness requirement = <0.01 mm
- Surface Roughness = <3.2 µm

Process Scenario (Baseline Machining Conditions):

- Process: Drill & Reaming
- Material: Gray Cast Iron (FC250)
- Drill bit: Ø 9.8 x 87 x 133 mm (HSS: High Speed Steel)
- Reamer: Ø 10 mm, flute 66 mm, OAL 133 mm

Cutting Velocity and Spindle Speed

- Reaming Cutting Velocity = 15 m/min
  Corresponds to an approximate spindle speed of 475 rpm for the reamer.
- Drilling Cutting Velocity = 25 m/min
  Corresponds to an approximately spindle speed of 790 rpm for the drill bit.

The spindle speed is calculated using the standard machining relationship:

$$v = \frac{\pi d n}{1000}$$

Where:

$v = cutting\ velocity\ (mm)$

$d = tool\ diameter\ (mm)$

$n = spinndle\ speed\ (rpm)$

*Table 1: Scenario dataset used in the drilling-reaming questionnaire*

| ScenarioID | Coolant flag (on=1/off=0) | Speed Drill (rpm) | Speed Ream (rpm) | Feed (mm/ rev) | Tool Used (Hr) | Tool Life (Hr) | PilotHoleDiameter (mm) | Runout (mm) | Tool Overhang (mm) | Defect type |
|---|---|---|---|---|---|---|---|---|---|---|
| S01 | 1 | 600 | 200 | 0.1 | 10 | 1000 | 9.7 | 0.01 | 20 | Poor surface finish |
| S02 | 1 | 600 | 200 | 0.15 | 500 | 1000 | 9.8 | 0.03 | 40 | Poor roundness |
| S03 | 1 | 600 | 200 | 0.2 | 900 | 1000 | 9.9 | 0.06 | 60 | Poor roundness |
| S04 | 1 | 800 | 500 | 0.1 | 10 | 1000 | 9.8 | 0.03 | 60 | Chatter mark |
| S05 | 1 | 800 | 500 | 0.15 | 500 | 1000 | 9.9 | 0.06 | 20 | Oversize hole |
| S06 | 1 | 800 | 500 | 0.2 | 900 | 1000 | 9.7 | 0.01 | 40 | Poor surface finish |
| S07 | 1 | 1000 | 700 | 0.1 | 500 | 1000 | 9.7 | 0.06 | 40 | Poor roundness |
| S08 | 1 | 1000 | 700 | 0.15 | 900 | 1000 | 9.8 | 0.01 | 60 | Chatter marks |
| S09 | 1 | 1000 | 700 | 0.2 | 10 | 1000 | 9.9 | 0.03 | 20 | Undersize |
| S10 | 0 | 600 | 200 | 0.1 | 900 | 1000 | 9.9 | 0.03 | 40 | Scoring |
| S11 | 0 | 600 | 200 | 0.15 | 10 | 1000 | 9.7 | 0.06 | 60 | Chatter marks |
| S12 | 0 | 600 | 200 | 0.2 | 500 | 1000 | 9.8 | 0.01 | 20 | Poor surface finish |
| S13 | 0 | 800 | 500 | 0.1 | 500 | 1000 | 9.9 | 0.01 | 60 | Taper |
| S14 | 0 | 800 | 500 | 0.15 | 900 | 1000 | 9.7 | 0.03 | 20 | Poor surface finish |
| S15 | 0 | 800 | 500 | 0.2 | 10 | 1000 | 9.8 | 0.06 | 40 | Poor roundness |
| S16 | 0 | 1000 | 700 | 0.1 | 900 | 1000 | 9.8 | 0.06 | 20 | Scoring |
| S17 | 0 | 1000 | 700 | 0.15 | 10 | 1000 | 9.9 | 0.01 | 40 | Undersize |
| S18 | 0 | 1000 | 700 | 0.2 | 500 | 1000 | 9.7 | 0.03 | 60 | Chatter marks |

**Questions**

1. Place carefully review **Scenario ID: 1,** including the process parameters and requirement specifications (tolerances, roundness, surface roughness).

Section 1: Root Cause Analysis

Q1. What is the most likely primary cause of the incomplete reaming in this scenario?
(Select One)

- A1: Tool wear/ tool condition.
- A2: Chip packing/ chip evacuation problem.
- A3: Inappropriate spindle speed.
- A4: Inappropriate feed rate.
- A5: Coolant not used.
- A6: Improper pilot hole (diameter/condition).
- A7: Runout/ alignment/ work holding issue.
- A8: Excessive tool overhang.

Q2. Is there a secondary contributing cause?
(Select One or None)

- A1: Tool wear/ tool condition.
- A2: Chip packing/ chip evacuation problem.
- A3: Inappropriate spindle speed.
- A4: Inappropriate feed rate.
- A5: Coolant not used.
- A6: Improper pilot hole (diameter/condition).
- A7: Runout/ alignment/ work holding issue.
- A8: Excessive tool overhang.
- None (No secondary cause).

Q3. How confident are you in your root cause analysis?
(Select One)

- 1- Very Low
- 2- Low
- 3- Medium
- 4- High
- 5- Very High

Section 2: Decision Making

Q4. Based on the given requirements.
(Diameter tolerance, depth tolerance, surface roughness),
what decision do you recommend for this lot?
(Select One)

- D1: Rework
- D2: Scarp
- D3: Hold/further investigation
- D4: Accept as-is

Section3: Corrective Action

Q5. What is the primary corrective action you recommend?
(Select One)

- C1: Replace or regrind reamer
- C2: Adjust feed speed
- C3: Adjust feed rate
- C4: Use coolant
- C5: Modify pilot hole size or drilling process
- C6: Correct runout/ alignment/ work holding
- C7: Reduce tool overhang
- C8: Improve chip evacuation method (e.g., intermittent withdrawal/ pecking)

Q6. Is there a secondary corrective action you would recommend?
(Select One or None)

- C1: Replace or regrind reamer
- C2: Adjust feed speed
- C3: Adjust feed rate
- C4: Use coolant
- C5: Modify pilot hole size or drilling process
- C6: Correct runout/ alignment/ work holding
- C7: Reduce tool overhang
- C8: Improve chip evacuation method (e.g., intermittent withdrawal/ pecking)
- None

Section4: Effectiveness and Urgency Assessment

Q7. How effective do you expect the selected corrective action(s) to be in reducing this defect?
(Select One)

- 1: Less than 50%
- 2: 50-70%
- 3: 70-90%
- 4: More than 90%

Q8. How urgent is it to implement corrective action for this issue?
(Select One)

- 1: Not urgent
- 2: Low urgency
- 3: Medium urgency
- 4: High urgency
- 5: Very high urgency

**2**. Place carefully review **Scenario ID: 2**, including the process parameters and requirement specifications (tolerances, roundness, surface roughness).

Section 1: Root Cause Analysis

Q1. What is the most likely primary cause of the incomplete reaming in this scenario?
(Select One)

- A1: Tool wear/ tool condition.
- A2: Chip packing/ chip evacuation problem.
- A3: Inappropriate spindle speed.
- A4: Inappropriate feed rate.
- A5: Coolant not used.
- A6: Improper pilot hole (diameter/condition).
- A7: Runout/ alignment/ work holding issue.
- A8: Excessive tool overhang.

Q2. Is there a secondary contributing cause?
(Select One or None)

- A1: Tool wear/ tool condition.
- A2: Chip packing/ chip evacuation problem.
- A3: Inappropriate spindle speed.
- A4: Inappropriate feed rate.
- A5: Coolant not used.
- A6: Improper pilot hole (diameter/condition).
- A7: Runout/ alignment/ work holding issue.
- A8: Excessive tool overhang.
- None (No secondary cause).

Q3. How confident are you in your root cause analysis?
(Select One)

- 1- Very Low
- 2- Low
- 3- Medium
- 4- High
- 5- Very High

Section 2: Decision Making

Q4. Based on the given requirements.
(Diameter tolerance, depth tolerance, surface roughness),
what decision do you recommend for this lot?
(Select One)

- D1: Rework
- D2: Scarp
- D3: Hold/further investigation
- D4: Accept as-is

Section3: Corrective Action

Q5. What is the primary corrective action you recommend?
(Select One)

- C1: Replace or regrind reamer
- C2: Adjust feed speed
- C3: Adjust feed rate
- C4: Use coolant
- C5: Modify pilot hole size or drilling process
- C6: Correct runout/ alignment/ work holding
- C7: Reduce tool overhang
- C8: Improve chip evacuation method (e.g., intermittent withdrawal/ pecking)

Q6. Is there a secondary corrective action you would recommend?
(Select One or None)

- C1: Replace or regrind reamer
- C2: Adjust feed speed
- C3: Adjust feed rate
- C4: Use coolant
- C5: Modify pilot hole size or drilling process
- C6: Correct runout/ alignment/ work holding
- C7: Reduce tool overhang
- C8: Improve chip evacuation method (e.g., intermittent withdrawal/ pecking)
- None

Section4: Effectiveness and Urgency Assessment

Q7. How effective do you expect the selected corrective action(s) to be in reducing this defect?
(Select One)

- 1: Less than 50%
- 2: 50-70%
- 3: 70-90%
- 4: More than 90%

Q8. How urgent is it to implement corrective action for this issue?
(Select One)

- 1: Not urgent
- 2: Low urgency
- 3: Medium urgency
- 4: High urgency
- 5: Very high urgency

**3.** Place carefully review **Scenario ID: 3**, including the process parameters and requirement specifications (tolerances, roundness, surface roughness).

Section 1: Root Cause Analysis

Q1. What is the most likely primary cause of the incomplete reaming in this scenario?
(Select One)

- A1: Tool wear/ tool condition.
- A2: Chip packing/ chip evacuation problem.
- A3: Inappropriate spindle speed.
- A4: Inappropriate feed rate.
- A5: Coolant not used.
- A6: Improper pilot hole (diameter/condition).
- A7: Runout/ alignment/ work holding issue.
- A8: Excessive tool overhang.

Q2. Is there a secondary contributing cause?
(Select One or None)

- A1: Tool wear/ tool condition.
- A2: Chip packing/ chip evacuation problem.
- A3: Inappropriate spindle speed.
- A4: Inappropriate feed rate.
- A5: Coolant not used.
- A6: Improper pilot hole (diameter/condition).
- A7: Runout/ alignment/ work holding issue.
- A8: Excessive tool overhang.
- None (No secondary cause).

Q3. How confident are you in your root cause analysis?
(Select One)

- 1- Very Low
- 2- Low
- 3- Medium
- 4- High
- 5- Very High

Section 2: Decision Making

Q4. Based on the given requirements.
(Diameter tolerance, depth tolerance, surface roughness),
what decision do you recommend for this lot?
(Select One)

- D1: Rework
- D2: Scarp
- D3: Hold/further investigation
- D4: Accept as-is

Section3: Corrective Action

Q5. What is the primary corrective action you recommend?
(Select One)

- C1: Replace or regrind reamer.
- C2: Adjust feed speed.
- C3: Adjust feed rate.
- C4: Use coolant
- C5: Modify pilot hole size or drilling process.
- C6: Correct runout/ alignment/ work holding.
- C7: Reduce tool overhang.
- C8: Improve chip evacuation method (e.g., intermittent withdrawal/ pecking)

Q6. Is there a secondary corrective action you would recommend?
(Select One or None)

- C1: Replace or regrind reamer.
- C2: Adjust feed speed.
- C3: Adjust feed rate.
- C4: Use coolant
- C5: Modify pilot hole size or drilling process.
- C6: Correct runout/ alignment/ work holding.
- C7: Reduce tool overhang.
- C8: Improve chip evacuation method (e.g., intermittent withdrawal/ pecking)
- None

Section4: Effectiveness and Urgency Assessment

Q7. How effective do you expect the selected corrective action(s) to be in reducing this defect?
(Select One)

- 1: Less than 50%
- 2: 50-70%
- 3: 70-90%
- 4: More than 90%

Q8. How urgent is it to implement corrective action for this issue?
(Select One)

- 1: Not urgent
- 2: Low urgency
- 3: Medium urgency
- 4: High urgency
- 5: Very high urgency

**4.** Place carefully review **Scenario ID: 4**, including the process parameters and requirement specifications (tolerances, roundness, surface roughness).

Section 1: Root Cause Analysis

Q1. What is the most likely primary cause of the incomplete reaming in this scenario?
(Select One)

- A1: Tool wear/ tool condition.
- A2: Chip packing/ chip evacuation problem.
- A3: Inappropriate spindle speed.
- A4: Inappropriate feed rate.
- A5: Coolant not used.
- A6: Improper pilot hole (diameter/condition).
- A7: Runout/ alignment/ work holding issue.
- A8: Excessive tool overhang.

Q2. Is there a secondary contributing cause?
(Select One or None)

- A1: Tool wear/ tool condition.
- A2: Chip packing/ chip evacuation problem.
- A3: Inappropriate spindle speed.
- A4: Inappropriate feed rate.
- A5: Coolant not used.
- A6: Improper pilot hole (diameter/condition).
- A7: Runout/ alignment/ work holding issue.
- A8: Excessive tool overhang.
- None (No secondary cause).

Q3. How confident are you in your root cause analysis?
(Select One)

- 1- Very Low
- 2- Low
- 3- Medium
- 4- High
- 5- Very High

Section 2: Decision Making

Q4. Based on the given requirements.
(Diameter tolerance, depth tolerance, surface roughness),
what decision do you recommend for this lot?
(Select One)

- D1: Rework
- D2: Scarp
- D3: Hold/further investigation
- D4: Accept as-is

Section3: Corrective Action

Q5. What is the primary corrective action you recommend?
(Select One)

- C1: Replace or regrind reamer.
- C2: Adjust feed speed.
- C3: Adjust feed rate.
- C4: Use coolant
- C5: Modify pilot hole size or drilling process.
- C6: Correct runout/ alignment/ work holding.
- C7: Reduce tool overhang.
- C8: Improve chip evacuation method (e.g., intermittent withdrawal/ pecking)

Q6. Is there a secondary corrective action you would recommend?
(Select One or None)

- C1: Replace or regrind reamer.
- C2: Adjust feed speed.
- C3: Adjust feed rate.
- C4: Use coolant
- C5: Modify pilot hole size or drilling process.
- C6: Correct runout/ alignment/ work holding.
- C7: Reduce tool overhang.
- C8: Improve chip evacuation method (e.g., intermittent withdrawal/ pecking)
- None

Section4: Effectiveness and Urgency Assessment

Q7. How effective do you expect the selected corrective action(s) to be in reducing this defect?
(Select One)

- 1: Less than 50%
- 2: 50-70%
- 3: 70-90%
- 4: More than 90%

Q8. How urgent is it to implement corrective action for this issue?
(Select One)

- 1: Not urgent
- 2: Low urgency
- 3: Medium urgency
- 4: High urgency
- 5: Very high urgency

**5.** Place carefully review **Scenario ID: 5**, including the process parameters and requirement specifications (tolerances, roundness, surface roughness).

Section 1: Root Cause Analysis

Q1. What is the most likely primary cause of the incomplete reaming in this scenario?
(Select One)

- A1: Tool wear/ tool condition.
- A2: Chip packing/ chip evacuation problem.
- A3: Inappropriate spindle speed.
- A4: Inappropriate feed rate.
- A5: Coolant not used.
- A6: Improper pilot hole (diameter/condition).
- A7: Runout/ alignment/ work holding issue.
- A8: Excessive tool overhang.

Q2. Is there a secondary contributing cause?
(Select One or None)

- A1: Tool wear/ tool condition.
- A2: Chip packing/ chip evacuation problem.
- A3: Inappropriate spindle speed.
- A4: Inappropriate feed rate.
- A5: Coolant not used.
- A6: Improper pilot hole (diameter/condition).
- A7: Runout/ alignment/ work holding issue.
- A8: Excessive tool overhang.
- None (No secondary cause).

Q3. How confident are you in your root cause analysis?
(Select One)

- 1- Very Low
- 2- Low
- 3- Medium
- 4- High
- 5- Very High

Section 2: Decision Making

Q4. Based on the given requirements.
(Diameter tolerance, depth tolerance, surface roughness),
what decision do you recommend for this lot?
(Select One)

- D1: Rework
- D2: Scarp
- D3: Hold/further investigation
- D4: Accept as-is

Section3: Corrective Action

Q5. What is the primary corrective action you recommend?
(Select One)

- C1: Replace or regrind reamer.
- C2: Adjust feed speed.
- C3: Adjust feed rate.
- C4: Use coolant
- C5: Modify pilot hole size or drilling process.
- C6: Correct runout/ alignment/ work holding.
- C7: Reduce tool overhang.
- C8: Improve chip evacuation method (e.g., intermittent withdrawal/ pecking)

Q6. Is there a secondary corrective action you would recommend?
(Select One or None)

- C1: Replace or regrind reamer.
- C2: Adjust feed speed.
- C3: Adjust feed rate.
- C4: Use coolant
- C5: Modify pilot hole size or drilling process.
- C6: Correct runout/ alignment/ work holding.
- C7: Reduce tool overhang.
- C8: Improve chip evacuation method (e.g., intermittent withdrawal/ pecking)
- None

Section4: Effectiveness and Urgency Assessment

Q7. How effective do you expect the selected corrective action(s) to be in reducing this defect?
(Select One)

- 1: Less than 50%
- 2: 50-70%
- 3: 70-90%
- 4: More than 90%

Q8. How urgent is it to implement corrective action for this issue?
(Select One)

- 1: Not urgent
- 2: Low urgency
- 3: Medium urgency
- 4: High urgency
- 5: Very high urgency

**6.** Place carefully review **Scenario ID: 6**, including the process parameters and requirement specifications (tolerances, roundness, surface roughness).

Section 1: Root Cause Analysis

Q1. What is the most likely primary cause of the incomplete reaming in this scenario?
(Select One)

- A1: Tool wear/ tool condition.
- A2: Chip packing/ chip evacuation problem.
- A3: Inappropriate spindle speed.
- A4: Inappropriate feed rate.
- A5: Coolant not used.
- A6: Improper pilot hole (diameter/condition).
- A7: Runout/ alignment/ work holding issue.
- A8: Excessive tool overhang.

Q2. Is there a secondary contributing cause?
(Select One or None)

- A1: Tool wear/ tool condition.
- A2: Chip packing/ chip evacuation problem.
- A3: Inappropriate spindle speed.
- A4: Inappropriate feed rate.
- A5: Coolant not used.
- A6: Improper pilot hole (diameter/condition).
- A7: Runout/ alignment/ work holding issue.
- A8: Excessive tool overhang.
- None (No secondary cause).

Q3. How confident are you in your root cause analysis?
(Select One)

- 1- Very Low
- 2- Low
- 3- Medium
- 4- High
- 5- Very High

Section 2: Decision Making

Q4. Based on the given requirements.
(Diameter tolerance, depth tolerance, surface roughness),
what decision do you recommend for this lot?
(Select One)

- D1: Rework
- D2: Scarp
- D3: Hold/further investigation
- D4: Accept as-is

Section3: Corrective Action

Q5. What is the primary corrective action you recommend?
(Select One)

- C1: Replace or regrind reamer.
- C2: Adjust feed speed.
- C3: Adjust feed rate.
- C4: Use coolant
- C5: Modify pilot hole size or drilling process.
- C6: Correct runout/ alignment/ work holding.
- C7: Reduce tool overhang.
- C8: Improve chip evacuation method (e.g., intermittent withdrawal/ pecking)

Q6. Is there a secondary corrective action you would recommend?
(Select One or None)

- C1: Replace or regrind reamer.
- C2: Adjust feed speed.
- C3: Adjust feed rate.
- C4: Use coolant
- C5: Modify pilot hole size or drilling process.
- C6: Correct runout/ alignment/ work holding.
- C7: Reduce tool overhang.
- C8: Improve chip evacuation method (e.g., intermittent withdrawal/ pecking)
- None

Section4: Effectiveness and Urgency Assessment

Q7. How effective do you expect the selected corrective action(s) to be in reducing this defect?
(Select One)

- 1: Less than 50%
- 2: 50-70%
- 3: 70-90%
- 4: More than 90%

Q8. How urgent is it to implement corrective action for this issue?
(Select One)

- 1: Not urgent
- 2: Low urgency
- 3: Medium urgency
- 4: High urgency
- 5: Very high urgency

**7.** Place carefully review **Scenario ID: 7**, including the process parameters and requirement specifications (tolerances, roundness, surface roughness).

Section 1: Root Cause Analysis

Q1. What is the most likely primary cause of the incomplete reaming in this scenario?
(Select One)

- A1: Tool wear/ tool condition.
- A2: Chip packing/ chip evacuation problem.
- A3: Inappropriate spindle speed.
- A4: Inappropriate feed rate.
- A5: Coolant not used.
- A6: Improper pilot hole (diameter/condition).
- A7: Runout/ alignment/ work holding issue.
- A8: Excessive tool overhang.

Q2. Is there a secondary contributing cause?
(Select One or None)

- A1: Tool wear/ tool condition.
- A2: Chip packing/ chip evacuation problem.
- A3: Inappropriate spindle speed.
- A4: Inappropriate feed rate.
- A5: Coolant not used.
- A6: Improper pilot hole (diameter/condition).
- A7: Runout/ alignment/ work holding issue.
- A8: Excessive tool overhang.
- None (No secondary cause).

Q3. How confident are you in your root cause analysis?
(Select One)

- 1- Very Low
- 2- Low
- 3- Medium
- 4- High
- 5- Very High

Section 2: Decision Making

Q4. Based on the given requirements.
(Diameter tolerance, depth tolerance, surface roughness),
what decision do you recommend for this lot?
(Select One)

- D1: Rework
- D2: Scarp
- D3: Hold/further investigation
- D4: Accept as-is

Section3: Corrective Action

Q5. What is the primary corrective action you recommend?
(Select One)

- C1: Replace or regrind reamer.
- C2: Adjust feed speed.
- C3: Adjust feed rate.
- C4: Use coolant
- C5: Modify pilot hole size or drilling process.
- C6: Correct runout/ alignment/ work holding.
- C7: Reduce tool overhang.
- C8: Improve chip evacuation method (e.g., intermittent withdrawal/ pecking)

Q6. Is there a secondary corrective action you would recommend?
(Select One or None)

- C1: Replace or regrind reamer.
- C2: Adjust feed speed.
- C3: Adjust feed rate.
- C4: Use coolant
- C5: Modify pilot hole size or drilling process.
- C6: Correct runout/ alignment/ work holding.
- C7: Reduce tool overhang.
- C8: Improve chip evacuation method (e.g., intermittent withdrawal/ pecking)
- None

Section4: Effectiveness and Urgency Assessment

Q7. How effective do you expect the selected corrective action(s) to be in reducing this defect?
(Select One)

- 1: Less than 50%
- 2: 50-70%
- 3: 70-90%
- 4: More than 90%

Q8. How urgent is it to implement corrective action for this issue?
(Select One)

- 1: Not urgent
- 2: Low urgency
- 3: Medium urgency
- 4: High urgency
- 5: Very high urgency

**8.** Place carefully review **Scenario ID: 8**, including the process parameters and requirement specifications (tolerances, roundness, surface roughness).

Section 1: Root Cause Analysis

Q1. What is the most likely primary cause of the incomplete reaming in this scenario?
(Select One)

- A1: Tool wear/ tool condition.
- A2: Chip packing/ chip evacuation problem.
- A3: Inappropriate spindle speed.
- A4: Inappropriate feed rate.
- A5: Coolant not used.
- A6: Improper pilot hole (diameter/condition).
- A7: Runout/ alignment/ work holding issue.
- A8: Excessive tool overhang.

Q2. Is there a secondary contributing cause?
(Select One or None)

- A1: Tool wear/ tool condition.
- A2: Chip packing/ chip evacuation problem.
- A3: Inappropriate spindle speed.
- A4: Inappropriate feed rate.
- A5: Coolant not used.
- A6: Improper pilot hole (diameter/condition).
- A7: Runout/ alignment/ work holding issue.
- A8: Excessive tool overhang.
- None (No secondary cause).

Q3. How confident are you in your root cause analysis?
(Select One)

- 1- Very Low
- 2- Low
- 3- Medium
- 4- High
- 5- Very High

Section 2: Decision Making

Q4. Based on the given requirements.
(Diameter tolerance, depth tolerance, surface roughness),
what decision do you recommend for this lot?
(Select One)

- D1: Rework
- D2: Scarp
- D3: Hold/further investigation
- D4: Accept as-is

Section3: Corrective Action

Q5. What is the primary corrective action you recommend?
(Select One)

- C1: Replace or regrind reamer.
- C2: Adjust feed speed.
- C3: Adjust feed rate.
- C4: Use coolant
- C5: Modify pilot hole size or drilling process.
- C6: Correct runout/ alignment/ work holding.
- C7: Reduce tool overhang.
- C8: Improve chip evacuation method (e.g., intermittent withdrawal/ pecking)

Q6. Is there a secondary corrective action you would recommend?
(Select One or None)

- C1: Replace or regrind reamer.
- C2: Adjust feed speed.
- C3: Adjust feed rate.
- C4: Use coolant
- C5: Modify pilot hole size or drilling process.
- C6: Correct runout/ alignment/ work holding.
- C7: Reduce tool overhang.
- C8: Improve chip evacuation method (e.g., intermittent withdrawal/ pecking)
- None

Section4: Effectiveness and Urgency Assessment

Q7. How effective do you expect the selected corrective action(s) to be in reducing this defect?
(Select One)

- 1: Less than 50%
- 2: 50-70%
- 3: 70-90%
- 4: More than 90%

Q8. How urgent is it to implement corrective action for this issue?
(Select One)

- 1: Not urgent
- 2: Low urgency
- 3: Medium urgency
- 4: High urgency
- 5: Very high urgency

**9.** Place carefully review **Scenario ID: 9**, including the process parameters and requirement specifications (tolerances, roundness, surface roughness).

Section 1: Root Cause Analysis

Q1. What is the most likely primary cause of the incomplete reaming in this scenario?
(Select One)

- A1: Tool wear/ tool condition.
- A2: Chip packing/ chip evacuation problem.
- A3: Inappropriate spindle speed.
- A4: Inappropriate feed rate.
- A5: Coolant not used.
- A6: Improper pilot hole (diameter/condition).
- A7: Runout/ alignment/ work holding issue.
- A8: Excessive tool overhang.

Q2. Is there a secondary contributing cause?
(Select One or None)

- A1: Tool wear/ tool condition.
- A2: Chip packing/ chip evacuation problem.
- A3: Inappropriate spindle speed.
- A4: Inappropriate feed rate.
- A5: Coolant not used.
- A6: Improper pilot hole (diameter/condition).
- A7: Runout/ alignment/ work holding issue.
- A8: Excessive tool overhang.
- None (No secondary cause).

Q3. How confident are you in your root cause analysis?
(Select One)

- 1- Very Low
- 2- Low
- 3- Medium
- 4- High
- 5- Very High

Section 2: Decision Making

Q4. Based on the given requirements.
(Diameter tolerance, depth tolerance, surface roughness),
what decision do you recommend for this lot?
(Select One)

- D1: Rework
- D2: Scarp
- D3: Hold/further investigation
- D4: Accept as-is

Section3: Corrective Action

Q5. What is the primary corrective action you recommend?
(Select One)

- C1: Replace or regrind reamer.
- C2: Adjust feed speed.
- C3: Adjust feed rate.
- C4: Use coolant
- C5: Modify pilot hole size or drilling process.
- C6: Correct runout/ alignment/ work holding.
- C7: Reduce tool overhang.
- C8: Improve chip evacuation method (e.g., intermittent withdrawal/ pecking)

Q6. Is there a secondary corrective action you would recommend?
(Select One or None)

- C1: Replace or regrind reamer.
- C2: Adjust feed speed.
- C3: Adjust feed rate.
- C4: Use coolant
- C5: Modify pilot hole size or drilling process.
- C6: Correct runout/ alignment/ work holding.
- C7: Reduce tool overhang.
- C8: Improve chip evacuation method (e.g., intermittent withdrawal/ pecking)
- None

Section4: Effectiveness and Urgency Assessment

Q7. How effective do you expect the selected corrective action(s) to be in reducing this defect?
(Select One)

- 1: Less than 50%
- 2: 50-70%
- 3: 70-90%
- 4: More than 90%

Q8. How urgent is it to implement corrective action for this issue?
(Select One)

- 1: Not urgent
- 2: Low urgency
- 3: Medium urgency
- 4: High urgency
- 5: Very high urgency

**10.** Place carefully review **Scenario ID: 10**, including the process parameters and requirement specifications (tolerances, roundness, surface roughness).

Section 1: Root Cause Analysis

Q1. What is the most likely primary cause of the incomplete reaming in this scenario?
(Select One)

- A1: Tool wear/ tool condition.
- A2: Chip packing/ chip evacuation problem.
- A3: Inappropriate spindle speed.
- A4: Inappropriate feed rate.
- A5: Coolant not used.
- A6: Improper pilot hole (diameter/condition).
- A7: Runout/ alignment/ work holding issue.
- A8: Excessive tool overhang.

Q2. Is there a secondary contributing cause?
(Select One or None)

- A1: Tool wear/ tool condition.
- A2: Chip packing/ chip evacuation problem.
- A3: Inappropriate spindle speed.
- A4: Inappropriate feed rate.
- A5: Coolant not used.
- A6: Improper pilot hole (diameter/condition).
- A7: Runout/ alignment/ work holding issue.
- A8: Excessive tool overhang.
- None (No secondary cause).

Q3. How confident are you in your root cause analysis?
(Select One)

- 1- Very Low
- 2- Low
- 3- Medium
- 4- High
- 5- Very High

Section 2: Decision Making

Q4. Based on the given requirements.
(Diameter tolerance, depth tolerance, surface roughness),
what decision do you recommend for this lot?
(Select One)

- D1: Rework
- D2: Scarp
- D3: Hold/further investigation
- D4: Accept as-is

Section3: Corrective Action

Q5. What is the primary corrective action you recommend?
(Select One)

- C1: Replace or regrind reamer.
- C2: Adjust feed speed.
- C3: Adjust feed rate.
- C4: Use coolant
- C5: Modify pilot hole size or drilling process.
- C6: Correct runout/ alignment/ work holding.
- C7: Reduce tool overhang.
- C8: Improve chip evacuation method (e.g., intermittent withdrawal/ pecking)

Q6. Is there a secondary corrective action you would recommend?
(Select One or None)

- C1: Replace or regrind reamer.
- C2: Adjust feed speed.
- C3: Adjust feed rate.
- C4: Use coolant
- C5: Modify pilot hole size or drilling process.
- C6: Correct runout/ alignment/ work holding.
- C7: Reduce tool overhang.
- C8: Improve chip evacuation method (e.g., intermittent withdrawal/ pecking)
- None

Section4: Effectiveness and Urgency Assessment

Q7. How effective do you expect the selected corrective action(s) to be in reducing this defect?
(Select One)

- 1: Less than 50%
- 2: 50-70%
- 3: 70-90%
- 4: More than 90%

Q8. How urgent is it to implement corrective action for this issue?
(Select One)

- 1: Not urgent
- 2: Low urgency
- 3: Medium urgency
- 4: High urgency
- 5: Very high urgency

**11.** Place carefully review **Scenario ID: 11**, including the process parameters and requirement specifications (tolerances, roundness, surface roughness).

Section 1: Root Cause Analysis

Q1. What is the most likely primary cause of the incomplete reaming in this scenario?
(Select One)

- A1: Tool wear/ tool condition.
- A2: Chip packing/ chip evacuation problem.
- A3: Inappropriate spindle speed.
- A4: Inappropriate feed rate.
- A5: Coolant not used.
- A6: Improper pilot hole (diameter/condition).
- A7: Runout/ alignment/ work holding issue.
- A8: Excessive tool overhang.

Q2. Is there a secondary contributing cause?
(Select One or None)

- A1: Tool wear/ tool condition.
- A2: Chip packing/ chip evacuation problem.
- A3: Inappropriate spindle speed.
- A4: Inappropriate feed rate.
- A5: Coolant not used.
- A6: Improper pilot hole (diameter/condition).
- A7: Runout/ alignment/ work holding issue.
- A8: Excessive tool overhang.
- None (No secondary cause).

Q3. How confident are you in your root cause analysis?
(Select One)

- 1- Very Low
- 2- Low
- 3- Medium
- 4- High
- 5- Very High

Section 2: Decision Making

Q4. Based on the given requirements.
(Diameter tolerance, depth tolerance, surface roughness),
what decision do you recommend for this lot?
(Select One)

- D1: Rework
- D2: Scarp
- D3: Hold/further investigation
- D4: Accept as-is

Section3: Corrective Action

Q5. What is the primary corrective action you recommend?
(Select One)

- C1: Replace or regrind reamer.
- C2: Adjust feed speed.
- C3: Adjust feed rate.
- C4: Use coolant
- C5: Modify pilot hole size or drilling process.
- C6: Correct runout/ alignment/ work holding.
- C7: Reduce tool overhang.
- C8: Improve chip evacuation method (e.g., intermittent withdrawal/ pecking)

Q6. Is there a secondary corrective action you would recommend?
(Select One or None)

- C1: Replace or regrind reamer.
- C2: Adjust feed speed.
- C3: Adjust feed rate.
- C4: Use coolant
- C5: Modify pilot hole size or drilling process.
- C6: Correct runout/ alignment/ work holding.
- C7: Reduce tool overhang.
- C8: Improve chip evacuation method (e.g., intermittent withdrawal/ pecking)
- None

Section4: Effectiveness and Urgency Assessment

Q7. How effective do you expect the selected corrective action(s) to be in reducing this defect?
(Select One)

- 1: Less than 50%
- 2: 50-70%
- 3: 70-90%
- 4: More than 90%

Q8. How urgent is it to implement corrective action for this issue?
(Select One)

- 1: Not urgent
- 2: Low urgency
- 3: Medium urgency
- 4: High urgency
- 5: Very high urgency

**12.** Place carefully review **Scenario ID: 12**, including the process parameters and requirement specifications (tolerances, roundness, surface roughness).

Section 1: Root Cause Analysis

Q1. What is the most likely primary cause of the incomplete reaming in this scenario?
(Select One)

- A1: Tool wear/ tool condition.
- A2: Chip packing/ chip evacuation problem.
- A3: Inappropriate spindle speed.
- A4: Inappropriate feed rate.
- A5: Coolant not used.
- A6: Improper pilot hole (diameter/condition).
- A7: Runout/ alignment/ work holding issue.
- A8: Excessive tool overhang.

Q2. Is there a secondary contributing cause?
(Select One or None)

- A1: Tool wear/ tool condition.
- A2: Chip packing/ chip evacuation problem.
- A3: Inappropriate spindle speed.
- A4: Inappropriate feed rate.
- A5: Coolant not used.
- A6: Improper pilot hole (diameter/condition).
- A7: Runout/ alignment/ work holding issue.
- A8: Excessive tool overhang.
- None (No secondary cause).

Q3. How confident are you in your root cause analysis?
(Select One)

- 1- Very Low
- 2- Low
- 3- Medium
- 4- High
- 5- Very High

Section 2: Decision Making

Q4. Based on the given requirements.
(Diameter tolerance, depth tolerance, surface roughness),
what decision do you recommend for this lot?
(Select One)

- D1: Rework
- D2: Scarp
- D3: Hold/further investigation
- D4: Accept as-is

Section3: Corrective Action

Q5. What is the primary corrective action you recommend?
(Select One)

- C1: Replace or regrind reamer.
- C2: Adjust feed speed.
- C3: Adjust feed rate.
- C4: Use coolant
- C5: Modify pilot hole size or drilling process.
- C6: Correct runout/ alignment/ work holding.
- C7: Reduce tool overhang.
- C8: Improve chip evacuation method (e.g., intermittent withdrawal/ pecking)

Q6. Is there a secondary corrective action you would recommend?
(Select One or None)

- C1: Replace or regrind reamer.
- C2: Adjust feed speed.
- C3: Adjust feed rate.
- C4: Use coolant
- C5: Modify pilot hole size or drilling process.
- C6: Correct runout/ alignment/ work holding.
- C7: Reduce tool overhang.
- C8: Improve chip evacuation method (e.g., intermittent withdrawal/ pecking)
- None

Section4: Effectiveness and Urgency Assessment

Q7. How effective do you expect the selected corrective action(s) to be in reducing this defect?
(Select One)

- 1: Less than 50%
- 2: 50-70%
- 3: 70-90%
- 4: More than 90%

Q8. How urgent is it to implement corrective action for this issue?
(Select One)

- 1: Not urgent
- 2: Low urgency
- 3: Medium urgency
- 4: High urgency
- 5: Very high urgency

**13.** Place carefully review **Scenario ID: 13**, including the process parameters and requirement specifications (tolerances, roundness, surface roughness).

Section 1: Root Cause Analysis

Q1. What is the most likely primary cause of the incomplete reaming in this scenario?
(Select One)

- A1: Tool wear/ tool condition.
- A2: Chip packing/ chip evacuation problem.
- A3: Inappropriate spindle speed.
- A4: Inappropriate feed rate.
- A5: Coolant not used.
- A6: Improper pilot hole (diameter/condition).
- A7: Runout/ alignment/ work holding issue.
- A8: Excessive tool overhang.

Q2. Is there a secondary contributing cause?
(Select One or None)

- A1: Tool wear/ tool condition.
- A2: Chip packing/ chip evacuation problem.
- A3: Inappropriate spindle speed.
- A4: Inappropriate feed rate.
- A5: Coolant not used.
- A6: Improper pilot hole (diameter/condition).
- A7: Runout/ alignment/ work holding issue.
- A8: Excessive tool overhang.
- None (No secondary cause).

Q3. How confident are you in your root cause analysis?
(Select One)

- 1- Very Low
- 2- Low
- 3- Medium
- 4- High
- 5- Very High

Section 2: Decision Making

Q4. Based on the given requirements.
(Diameter tolerance, depth tolerance, surface roughness),
what decision do you recommend for this lot?
(Select One)

- D1: Rework
- D2: Scarp
- D3: Hold/further investigation
- D4: Accept as-is

Section3: Corrective Action

Q5. What is the primary corrective action you recommend?
(Select One)

- C1: Replace or regrind reamer.
- C2: Adjust feed speed.
- C3: Adjust feed rate.
- C4: Use coolant
- C5: Modify pilot hole size or drilling process.
- C6: Correct runout/ alignment/ work holding.
- C7: Reduce tool overhang.
- C8: Improve chip evacuation method (e.g., intermittent withdrawal/ pecking)

Q6. Is there a secondary corrective action you would recommend?
(Select One or None)

- C1: Replace or regrind reamer.
- C2: Adjust feed speed.
- C3: Adjust feed rate.
- C4: Use coolant
- C5: Modify pilot hole size or drilling process.
- C6: Correct runout/ alignment/ work holding.
- C7: Reduce tool overhang.
- C8: Improve chip evacuation method (e.g., intermittent withdrawal/ pecking)
- None

Section4: Effectiveness and Urgency Assessment

Q7. How effective do you expect the selected corrective action(s) to be in reducing this defect?
(Select One)

- 1: Less than 50%
- 2: 50-70%
- 3: 70-90%
- 4: More than 90%

Q8. How urgent is it to implement corrective action for this issue?
(Select One)

- 1: Not urgent
- 2: Low urgency
- 3: Medium urgency
- 4: High urgency
- 5: Very high urgency

**14.** Place carefully review **Scenario ID: 14**, including the process parameters and requirement specifications (tolerances, roundness, surface roughness).

Section 1: Root Cause Analysis

Q1. What is the most likely primary cause of the incomplete reaming in this scenario?
(Select One)

- A1: Tool wear/ tool condition.
- A2: Chip packing/ chip evacuation problem.
- A3: Inappropriate spindle speed.
- A4: Inappropriate feed rate.
- A5: Coolant not used.
- A6: Improper pilot hole (diameter/condition).
- A7: Runout/ alignment/ work holding issue.
- A8: Excessive tool overhang.

Q2. Is there a secondary contributing cause?
(Select One or None)

- A1: Tool wear/ tool condition.
- A2: Chip packing/ chip evacuation problem.
- A3: Inappropriate spindle speed.
- A4: Inappropriate feed rate.
- A5: Coolant not used.
- A6: Improper pilot hole (diameter/condition).
- A7: Runout/ alignment/ work holding issue.
- A8: Excessive tool overhang.
- None (No secondary cause).

Q3. How confident are you in your root cause analysis?
(Select One)

- 1- Very Low
- 2- Low
- 3- Medium
- 4- High
- 5- Very High

Section 2: Decision Making

Q4. Based on the given requirements.
(Diameter tolerance, depth tolerance, surface roughness),
what decision do you recommend for this lot?
(Select One)

- D1: Rework
- D2: Scarp
- D3: Hold/further investigation
- D4: Accept as-is

Section3: Corrective Action

Q5. What is the primary corrective action you recommend?
(Select One)

- C1: Replace or regrind reamer.
- C2: Adjust feed speed.
- C3: Adjust feed rate.
- C4: Use coolant
- C5: Modify pilot hole size or drilling process.
- C6: Correct runout/ alignment/ work holding.
- C7: Reduce tool overhang.
- C8: Improve chip evacuation method (e.g., intermittent withdrawal/ pecking)

Q6. Is there a secondary corrective action you would recommend?
(Select One or None)

- C1: Replace or regrind reamer.
- C2: Adjust feed speed.
- C3: Adjust feed rate.
- C4: Use coolant
- C5: Modify pilot hole size or drilling process.
- C6: Correct runout/ alignment/ work holding.
- C7: Reduce tool overhang.
- C8: Improve chip evacuation method (e.g., intermittent withdrawal/ pecking)
- None

Section4: Effectiveness and Urgency Assessment

Q7. How effective do you expect the selected corrective action(s) to be in reducing this defect?
(Select One)

- 1: Less than 50%
- 2: 50-70%
- 3: 70-90%
- 4: More than 90%

Q8. How urgent is it to implement corrective action for this issue?
(Select One)

- 1: Not urgent
- 2: Low urgency
- 3: Medium urgency
- 4: High urgency
- 5: Very high urgency

**15.** Place carefully review **Scenario ID: 15**, including the process parameters and requirement specifications (tolerances, roundness, surface roughness).

Section 1: Root Cause Analysis

Q1. What is the most likely primary cause of the incomplete reaming in this scenario?
(Select One)

- A1: Tool wear/ tool condition.
- A2: Chip packing/ chip evacuation problem.
- A3: Inappropriate spindle speed.
- A4: Inappropriate feed rate.
- A5: Coolant not used.
- A6: Improper pilot hole (diameter/condition).
- A7: Runout/ alignment/ work holding issue.
- A8: Excessive tool overhang.

Q2. Is there a secondary contributing cause?
(Select One or None)

- A1: Tool wear/ tool condition.
- A2: Chip packing/ chip evacuation problem.
- A3: Inappropriate spindle speed.
- A4: Inappropriate feed rate.
- A5: Coolant not used.
- A6: Improper pilot hole (diameter/condition).
- A7: Runout/ alignment/ work holding issue.
- A8: Excessive tool overhang.
- None (No secondary cause).

Q3. How confident are you in your root cause analysis?
(Select One)

- 1- Very Low
- 2- Low
- 3- Medium
- 4- High
- 5- Very High

Section 2: Decision Making

Q4. Based on the given requirements.
(Diameter tolerance, depth tolerance, surface roughness),
what decision do you recommend for this lot?
(Select One)

- D1: Rework
- D2: Scarp
- D3: Hold/further investigation
- D4: Accept as-is

Section3: Corrective Action

Q5. What is the primary corrective action you recommend?
(Select One)

- C1: Replace or regrind reamer.
- C2: Adjust feed speed.
- C3: Adjust feed rate.
- C4: Use coolant
- C5: Modify pilot hole size or drilling process.
- C6: Correct runout/ alignment/ work holding.
- C7: Reduce tool overhang.
- C8: Improve chip evacuation method (e.g., intermittent withdrawal/ pecking)

Q6. Is there a secondary corrective action you would recommend?
(Select One or None)

- C1: Replace or regrind reamer.
- C2: Adjust feed speed.
- C3: Adjust feed rate.
- C4: Use coolant
- C5: Modify pilot hole size or drilling process.
- C6: Correct runout/ alignment/ work holding.
- C7: Reduce tool overhang.
- C8: Improve chip evacuation method (e.g., intermittent withdrawal/ pecking)
- None

Section4: Effectiveness and Urgency Assessment

Q7. How effective do you expect the selected corrective action(s) to be in reducing this defect?
(Select One)

- 1: Less than 50%
- 2: 50-70%
- 3: 70-90%
- 4: More than 90%

Q8. How urgent is it to implement corrective action for this issue?
(Select One)

- 1: Not urgent
- 2: Low urgency
- 3: Medium urgency
- 4: High urgency
- 5: Very high urgency

**16.** Place carefully review **Scenario ID: 16**, including the process parameters and requirement specifications (tolerances, roundness, surface roughness).

Section 1: Root Cause Analysis

Q1. What is the most likely primary cause of the incomplete reaming in this scenario?
(Select One)

- A1: Tool wear/ tool condition.
- A2: Chip packing/ chip evacuation problem.
- A3: Inappropriate spindle speed.
- A4: Inappropriate feed rate.
- A5: Coolant not used.
- A6: Improper pilot hole (diameter/condition).
- A7: Runout/ alignment/ work holding issue.
- A8: Excessive tool overhang.

Q2. Is there a secondary contributing cause?
(Select One or None)

- A1: Tool wear/ tool condition.
- A2: Chip packing/ chip evacuation problem.
- A3: Inappropriate spindle speed.
- A4: Inappropriate feed rate.
- A5: Coolant not used.
- A6: Improper pilot hole (diameter/condition).
- A7: Runout/ alignment/ work holding issue.
- A8: Excessive tool overhang.
- None (No secondary cause).

Q3. How confident are you in your root cause analysis?
(Select One)

- 1- Very Low
- 2- Low
- 3- Medium
- 4- High
- 5- Very High

Section 2: Decision Making

Q4. Based on the given requirements.
(Diameter tolerance, depth tolerance, surface roughness),
what decision do you recommend for this lot?
(Select One)

- D1: Rework
- D2: Scarp
- D3: Hold/further investigation
- D4: Accept as-is

Section3: Corrective Action

Q5. What is the primary corrective action you recommend?
(Select One)

- C1: Replace or regrind reamer.
- C2: Adjust feed speed.
- C3: Adjust feed rate.
- C4: Use coolant
- C5: Modify pilot hole size or drilling process.
- C6: Correct runout/ alignment/ work holding.
- C7: Reduce tool overhang.
- C8: Improve chip evacuation method (e.g., intermittent withdrawal/ pecking)

Q6. Is there a secondary corrective action you would recommend?
(Select One or None)

- C1: Replace or regrind reamer.
- C2: Adjust feed speed.
- C3: Adjust feed rate.
- C4: Use coolant
- C5: Modify pilot hole size or drilling process.
- C6: Correct runout/ alignment/ work holding.
- C7: Reduce tool overhang.
- C8: Improve chip evacuation method (e.g., intermittent withdrawal/ pecking)
- None

Section4: Effectiveness and Urgency Assessment

Q7. How effective do you expect the selected corrective action(s) to be in reducing this defect?
(Select One)

- 1: Less than 50%
- 2: 50-70%
- 3: 70-90%
- 4: More than 90%

Q8. How urgent is it to implement corrective action for this issue?
(Select One)

- 1: Not urgent
- 2: Low urgency
- 3: Medium urgency
- 4: High urgency
- 5: Very high urgency

**17.** Place carefully review **Scenario ID: 17**, including the process parameters and requirement specifications (tolerances, roundness, surface roughness).

Section 1: Root Cause Analysis

Q1. What is the most likely primary cause of the incomplete reaming in this scenario?
(Select One)

- A1: Tool wear/ tool condition.
- A2: Chip packing/ chip evacuation problem.
- A3: Inappropriate spindle speed.
- A4: Inappropriate feed rate.
- A5: Coolant not used.
- A6: Improper pilot hole (diameter/condition).
- A7: Runout/ alignment/ work holding issue.
- A8: Excessive tool overhang.

Q2. Is there a secondary contributing cause?
(Select One or None)

- A1: Tool wear/ tool condition.
- A2: Chip packing/ chip evacuation problem.
- A3: Inappropriate spindle speed.
- A4: Inappropriate feed rate.
- A5: Coolant not used.
- A6: Improper pilot hole (diameter/condition).
- A7: Runout/ alignment/ work holding issue.
- A8: Excessive tool overhang.
- None (No secondary cause).

Q3. How confident are you in your root cause analysis?
(Select One)

- 1- Very Low
- 2- Low
- 3- Medium
- 4- High
- 5- Very High

Section 2: Decision Making

Q4. Based on the given requirements.
(Diameter tolerance, depth tolerance, surface roughness),
what decision do you recommend for this lot?
(Select One)

- D1: Rework
- D2: Scarp
- D3: Hold/further investigation
- D4: Accept as-is

Section3: Corrective Action

Q5. What is the primary corrective action you recommend?
(Select One)

- C1: Replace or regrind reamer.
- C2: Adjust feed speed.
- C3: Adjust feed rate.
- C4: Use coolant
- C5: Modify pilot hole size or drilling process.
- C6: Correct runout/ alignment/ work holding.
- C7: Reduce tool overhang.
- C8: Improve chip evacuation method (e.g., intermittent withdrawal/ pecking)

Q6. Is there a secondary corrective action you would recommend?
(Select One or None)

- C1: Replace or regrind reamer.
- C2: Adjust feed speed.
- C3: Adjust feed rate.
- C4: Use coolant
- C5: Modify pilot hole size or drilling process.
- C6: Correct runout/ alignment/ work holding.
- C7: Reduce tool overhang.
- C8: Improve chip evacuation method (e.g., intermittent withdrawal/ pecking)
- None

Section4: Effectiveness and Urgency Assessment

Q7. How effective do you expect the selected corrective action(s) to be in reducing this defect?
(Select One)

- 1: Less than 50%
- 2: 50-70%
- 3: 70-90%
- 4: More than 90%

Q8. How urgent is it to implement corrective action for this issue?
(Select One)

- 1: Not urgent
- 2: Low urgency
- 3: Medium urgency
- 4: High urgency
- 5: Very high urgency

**18.** Place carefully review **Scenario ID: 18**, including the process parameters and requirement specifications (tolerances, roundness, surface roughness).

Section 1: Root Cause Analysis

Q1. What is the most likely primary cause of the incomplete reaming in this scenario?
(Select One)

- A1: Tool wear/ tool condition.
- A2: Chip packing/ chip evacuation problem.
- A3: Inappropriate spindle speed.
- A4: Inappropriate feed rate.
- A5: Coolant not used.
- A6: Improper pilot hole (diameter/condition).
- A7: Runout/ alignment/ work holding issue.
- A8: Excessive tool overhang.

Q2. Is there a secondary contributing cause?
(Select One or None)

- A1: Tool wear/ tool condition.
- A2: Chip packing/ chip evacuation problem.
- A3: Inappropriate spindle speed.
- A4: Inappropriate feed rate.
- A5: Coolant not used.
- A6: Improper pilot hole (diameter/condition).
- A7: Runout/ alignment/ work holding issue.
- A8: Excessive tool overhang.
- None (No secondary cause).

Q3. How confident are you in your root cause analysis?
(Select One)

- 1- Very Low
- 2- Low
- 3- Medium
- 4- High
- 5- Very High

Section 2: Decision Making

Q4. Based on the given requirements.
(Diameter tolerance, depth tolerance, surface roughness),
what decision do you recommend for this lot?
(Select One)

- D1: Rework
- D2: Scarp
- D3: Hold/further investigation
- D4: Accept as-is

Section3: Corrective Action

Q5. What is the primary corrective action you recommend?
(Select One)

- C1: Replace or regrind reamer.
- C2: Adjust feed speed.
- C3: Adjust feed rate.
- C4: Use coolant
- C5: Modify pilot hole size or drilling process.
- C6: Correct runout/ alignment/ work holding.
- C7: Reduce tool overhang.
- C8: Improve chip evacuation method (e.g., intermittent withdrawal/ pecking)

Q6. Is there a secondary corrective action you would recommend?
(Select One or None)

- C1: Replace or regrind reamer.
- C2: Adjust feed speed.
- C3: Adjust feed rate.
- C4: Use coolant
- C5: Modify pilot hole size or drilling process.
- C6: Correct runout/ alignment/ work holding.
- C7: Reduce tool overhang.
- C8: Improve chip evacuation method (e.g., intermittent withdrawal/ pecking)
- None

Section4: Effectiveness and Urgency Assessment

Q7. How effective do you expect the selected corrective action(s) to be in reducing this defect?
(Select One)

- 1: Less than 50%
- 2: 50-70%
- 3: 70-90%
- 4: More than 90%

Q8. How urgent is it to implement corrective action for this issue?
(Select One)

- 1: Not urgent
- 2: Low urgency
- 3: Medium urgency
- 4: High urgency
- 5: Very high urgency