

Rapport de Supervision IA -

Date : 2025-12-29 01:58:55

Résultat Anomalie constaté :

```
id : 6503
tsDetected : 1766969751.1438131
eventTs : 1766965335.155446
partId : P000006
cycle : 6
machine : M2 - Usinage Ébauche - Centre d'usinage pour l'ébauche de la pièce.
stepId : M2.06
stepName : APPROACH_POS
anomalyScore : 34.0
ruleAnomaly : True
ruleReasons : [{"rule": "INTERVAL_OVERRUN", "message": "Interval exceeds nominal ratio", "details": {"previous_step_ts": "2025-12-28T23:42:12.973037Z", "current_step_ts": "2025-12-28T23:42:15.155446Z", "observed_gap_seconds": 2, "nominal_step_duration_seconds": 1.0, "threshold_seconds": 1.2, "trigger_condition": "observed_gap_seconds > 1.1 * nominal_step_duration_seconds", "interpretation": "La durée observée entre deux steps dépasse le seuil nominal autorisé."}}]
hasStepError : False
nStepErrors : 0
cycleDurationS : 2.182
durationOverrunS : 1.182
eventsCount : 15
windowDays : 7
ewmaRatio : 1.0
rateRatio : 2.0
burstiness : -0.31363065184272504
hawkesScore : 34
confidence : LOW
status : OPEN
severity : MAJOR
createdAt : None
reportPath : None
```

Prompt :

Tu es un ingénieur process industriel senior spécialisé en analyse d'anomalies PLC.

LANGUE OBLIGATOIRE : FRANÇAIS UNIQUEMENT.

INTERDICTION ABSOLUE :

- anglais
- hypothèses non déduites des données
- extrapolation
- justification méthodologique
- conseil générique

PRINCIPE :

- Les règles déclenchées constituent la base causale.
- Le nominal est déjà intégré dans les règles.
- L'analyse doit rester strictement factuelle.

STYLE :

- Technique
- Direct
- Orienté terrain
- Phrases courtes
- Aucun ton narratif

OBJECTIF :

Analyser UNE anomalie de production par comparaison stricte entre comportement nominal et comportement réel observé.

DONNÉES OPÉRATIONNELLES :

- Pièce : P000006
- Machine : M2
- Step : M2.06
- Cycle : 6

DONNÉES TEMPORELLES :

- Durée nominale : 1,00 s
- Durée réelle : 2,18 s
- Écart mesuré : 1,18 s
- Type d'écart : REAL_LONGER_THAN_NOMINAL

RÈGLES DÉCLENCHEES :

RÈGLE 1 : INTERVAL_OVERRUN

Description brute : Interval exceeds nominal ratio

Condition de déclenchement : $\text{observed_gap_seconds} > 1.1 * \text{nominal_step_duration_seconds}$

Interprétation fournie par la règle : La durée observée entre deux steps dépasse le seuil nominal autorisé.

INDICATEURS STATISTIQUES :

- Occurrences : 15
- EWMA ratio : 1,00
- Rate ratio : 2,00
- Hawkes score : 34
- Confiance : LOW
- Sévérité : MAJOR

FORMAT DE SORTIE OBLIGATOIRE :

ANOMALIE :

Décrire factuellement l'anomalie détectée.

COMPORTEMENT RÉEL :

Décrire la séquence réelle observée à partir des règles.

ÉCART NOMINAL / RÉEL :

Qualifier l'écart sans inversion cause / conséquence.

IMPACT PRODUCTION :

Indiquer l'impact opérationnel mesurable.

Si non quantifiable, écrire explicitement : NON ÉVALUABLE.

CRITICITÉ :

Justifier la criticité à partir des indicateurs.

CONCLUSION :
2 à 3 phrases maximum.

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CONTEXTE DOCUMENTAIRE

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DOCUMENTATION TECHNIQUE DISPONIBLE (USAGE STRICTEMENT FACTUEL)

Les extraits suivants peuvent être utilisés UNIQUEMENT s'ils sont directement applicables aux règles déclenchées.

- Extrait :

```
{  
  "ligne_industrielle": {  
    "nom": "Ligne 5 machines - Usinage complet",  
    "cycle_nominal_s": 90  
  },  
  "workflow_global": {  
    "ordre_machines": [  
      "M1",  
      "M2",  
      "M3",  
      "M4",  
      "M5"  
    ],  
    "durees_nominale_s": {  
      "M1": 8,  
      "M2": 28,  
      "M3": 18,  
      "M4": 18,  
      "M5": 12,  
      "buffers": 6  
    }  
  },  
  "grafcet": {  
    "steps": [  
      {  
        "id": "S0",  
        "description": "Initialisation / Reset"  
      },  
      {  
        "id": "S1",  
        "machine": "M1",  
        "description": "Chargement & Préparation"  
      },  
      {  
        "id": "S2",  
        "machine": "M2",  
        "description": "Usinage ébauche"  
      },  
      {  
        "id": "S3",  
        "machine": "M3",  
        "description": "Usinage finition"  
      },  
      {  
        "id": "S4",  
        "machine": "M4",  
        "description": "Usinage finition"  
      }  
    ]  
  }  
}
```

```

"description": "Perçage & taraudage"
},
{
"id": "S5",
"machine": "M5",
"description": "Contrôle & déchargement"
},
{
"id": "S6",
"description": "Fin de cycle / boucle"
}
],
"transitions": [
{
"from": "S0",
"to": "S1",
"condition": "SAFETY_OK && START_CMD"
},
{
"from": "S1",
"to": "S2",
"condition": "S-M1-005 (M1_READY_OK)"
},
{
"from": "S2",
"to": "S3",
"condition": "S-M2-004 (M2_DONE_OK)"
},
{
"from": "S3",
"to": "S4",
"condition": "S-M3-004 (M3_DONE_OK)"
},
{
"from": "S4",
"to": "S5",
"condition": "S-M4-003 (M4_DONE_OK)"
},
{
"from": "S5",
"to": "S6",
"condition": "S-M5-004 (UNLOAD_OK)"
},
{
"from": "S6",
"to": "S1",
"condition": "NEXT_CYCLE_REQUIRED"
},
{
"from": "*",
"to": "S_ERR",
"condition": "ANY E-Mx-*** CRITIQUE"
}
],
},
"scenario_nominal": {
"sequence": [
{

```

```

"time_s": "0-8",
"start_at": 0,
"end_at": 8,
"machine": "M1",
"action": "Chargement, clamp, ID, alignement"
},
{
"time_s": "8-36",
"start_at": 8,
"end_at": 36,
"machine": "M2",
"action": "Passes d'ébauche rough"
},
{
"time_s": "36-54",
"start_at": 36,
"end_at": 54,
"machine": "M3",
"action": "Usinage finition + contrôle surface"
},
{
"time_s": "54-72",
"start_at": 54,
"end_at": 72,
"machine": "M4",
"action": "Perçage + taraudage"
},
{
"time_s": "72-90",
"start_at": 72,
"end_at": 90,
"machine": "M5",
"action": "Vision + mesure + déchargement"
}
]
},
"communication": {
"PLC": {
"protocole": "Profinet IRT",
"signaux": {
"M1_READY_FOR_M2": "bool",
"M2_DONE": "bool",
"M3_DONE": "bool",
"M4_DONE": "bool",
"M5_OK": "bool",
"M5_NOK": "bool"
}
},
"OPC_UA": {
"exemples_tags": [
"ns=2;s=M2/Process/LastCycleTimeMs",
"ns=2;s=M3/Surface/Roughness",
"ns=2;s=M4/Torque/Peak",
"ns=2;s=M5/"
]
}
},
Source : workflow.json | Page : ? | Score : 0.594
=====
```

RÈGLES ABSOLUES D'ANALYSE

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- Analyse STRICTEMENT factuelle
- Aucune hypothèse non déduite des données
- Si erreur PLC explicite : analyse événementielle prioritaire
- Les durées et déphasages sont des CONSÉQUENCES, jamais des causes
- Si données insuffisantes : le dire explicitement

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FORMAT DE SORTIE STRICT

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- Rapport structuré
- Phrases courtes
- Chiffres systématiques
- Aucun commentaire hors données

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Résultat IA

Okay, let's tackle this. The user wants an analysis of a production anomaly based on the given data and rules. First, I need to make sure I understand all the provided information.

The piece is P000006, machine M2, step M2.06, cycle 6. The nominal duration is 1.00 seconds, but the real duration is 2.18 seconds, leading to an overrun of 1.18 seconds. The rule triggered is INTERVAL_OVERRUN, which activates when observed_gap_seconds exceeds 1.1 times the nominal step duration.

Looking at the data, the actual time is more than 1.1 times the nominal ($1.00 * 1.1 = 1.10$), so 2.18 is indeed over that threshold. The statistical indicators show 15 occurrences, EWMA ratio 1.00, rate ratio 2.00, Hawkes score 34, confidence LOW, severity MAJOR.

Now, the user specified strict factual analysis without hypotheses or extrapolations. So I need to stick strictly to the data provided. The documentation mentions the workflow steps and transitions, but since the anomaly is in M2 step M2.06, which corresponds to "Usinage ébauche" (rough machining), I should check if there's any relevant info about that step.

The scenario nominal shows M2 running from 8-36 seconds, which is 28 seconds. But the current anomaly is in cycle 6, step M2.06 with a duration of 2.18s instead of 1.00s. Wait, maybe there's confusion here between the overall cycle and individual steps? The nominal cycle for the entire line is 90 seconds, but each machine has its own nominal time. For example, M2's nominal time is 28 seconds in the workflow_global. However, the current anomaly refers to a step (M2.06) with a duration of 1.00s, which might be a sub-step within M2's process.

But the user provided data for the specific step: duration nominal 1.00s, real 2.18s. So the rule is triggered because $2.18 > 1.1 * 1.00$ (which is 1.1). The statistical indicators are low confidence but major severity.

In the output format, I need to describe the anomaly factually, the real behavior, the gap, impact, and criticality based on the stats. Since the user mentioned not to use any hypotheses or extrapolations, I must avoid assuming causes beyond the data. Also, no generic advice.

So, for "ANOMALIE", it's a duration overrun in step M2.06. "COMPORTEMENT RÉEL" would be that the step took longer than nominal. The gap is 1.18s, which is over the threshold. Impact: since the cycle time

is extended, production rate decreases. But without specific data on how much it affects throughput, maybe it's non-quantifiable? Wait, the user said if not quantifiable, write "NON ÉVALUABLE". The impact here might be that each occurrence adds 1.18s to the cycle, but since the overall line cycle is 90s, maybe this step's delay affects the entire line. However, without knowing how many such steps are in the cycle or their cumulative effect, it's hard to quantify. So "NON ÉVALUABLE" for impact.

Criticité: based on indicators, severity is MAJOR and confidence LOW. But the user says to justify criticité from the indicators. The Hawkes score is 34, which might indicate a higher likelihood of being an anomaly, but with low confidence. However, since it's a major severity, even with low confidence, it's still critical.

Conclusion should be concise, stating the overrun and its implications based on the data.

ANOMALIE :

Durée du step M2.06 (P000006) prolongée de 1,18 s par rapport à la durée nominale de 1,00 s.

COMPORTEMENT RÉEL :

Le step M2.06 a pris 2,18 s au lieu de 1,00 s, déclenchant une surcharge d'intervalle.

ÉCART NOMINAL / RÉEL :

La durée réelle dépasse le seuil nominal autorisé ($1,1 \times 1,00 \text{ s} = 1,10 \text{ s}$).

IMPACT PRODUCTION :

NON ÉVALUABLE

CRITICITÉ :

Sévérité MAJOR avec confiance LOW. Le score Hawkes (34) et le ratio rate (2,00) indiquent une anomalie récurrente.

CONCLUSION :

Le step M2.06 a subi un retard de 1,18 s, déclenchant une surcharge d'intervalle. L'impact opérationnel reste non quantifiable.