Follow-up from JAPW session 7: Efficiency, reliability & tools across the complex

Many thanks to: Heiko, Nikos, Reyes + Michael, Piotr, Kostas, Ben
Automation is the future

• Automation is the way to ...
  ▪ ... save energy, time (of people and schedules) and money while achieving best performance and beam quality
  ▪ ... efficiently commission our accelerators

• What goal do we want to achieve?
  ▪ First discussions in the Efficiency Think Tank led to a clear proposal
    - Do we adopt it and make it our automation roadmap?

• We must address technical and organisational challenges at the same time!

“(...) automation (...) is not actually replacing the (...) the individual to work, it’s replacing a certain task (...) giving that individual the chance to work on something better.”

“(...) large organizations are going to have a hard time keeping pace.”

[WEForum]
Integral parts of the automation question...

- **Next generation cycle management, beam requests and scheduling**
  - How to better exploit **deadtime** (zero cycles)?
    - Who wants ...
      - 160 MeV – 2 GeV protons
      - low energy ions
  - **Dynamically build requests**
    - avoid dead time in SPS injectors for long flat bottom LHC/HiRadMat cycles while 1 injection only
  - **Sequential/dedicated operation** instead of parallel operation in the SPS: AWAKE,...

- **Classical automation**
  - Settings consistency, super settings, makerule consistency checks, etc.
Creating awareness and energy saving alternatives

- **Improve our energy (and equipment life) consumption monitoring**
  - Will also help to identify “missing consumers”

- **New rules during design:**
  - Establish policies, e.g. DC vs. pulses vs. permanent magnets
  - “sleep mode” for new equipment
  - avoid reusing old magnets and operating them in saturation

- **SPS is the lowest hanging fruit**
  - **NACONS:**
    - reconsider DC magnets
    - automation for reducing power consumptions of transfer lines when not needed
  - Sort out **hysteresis control**
  - **Interleave low energy** NA operation with **high energy** operation?
    - how to distribute downtime?
Organizational challenges

- **Vision:** “why are we doing this?”, “where are we going?”
  - Aligning strategies and profit from synergies: groups/departments versus projects/task forces

- **Settings Management Working Group**
  - Who establishes priorities, goals and allocates manpower? Reporting?
  - Where are other non-settings management software topics addressed?

- **Reduce/remove meetings during commissioning phases**
New directions

• **Beam + System Performance Tracking**
  - → preventive maintenance with automatic prognostics: reduce number of piquet interventions?
  - Online performance monitoring is the new black (UCAP & Co ... auto-pilots)

• **Scheduling**
  - Planning to consider beam quality requirements at end of commissioning
    - More/fewer parallel and dedicated MDs in blocks/weekly?
    - **Commissioning to recover top performance** vs. **providing what is required for physics setup**
  - Incorporate experiments’ plannings into schedules, communicate super cycle configurations, etc.
    - ASM?

• **Digital Twins**
  - Data driven models of as-built machines/systems for efficient operation

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