



STEP-NC Pilot Project Update

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STEP-NC Summary

- STEP-NC is the ISO 10303 (“STEP”) part that models production information for machining (AP-238)
- It is a feature-based model of machining operations (drill a hole, mill a pocket, machine a surface) intended to replace the 50-year-old “G code” way of programming
- It is integrated with STEP, so that raw stock and finished part geometry and feature tolerances, for example, are available to the machine tool at run time to enable “smart machining”
- Pilot projects over many years have shown benefits
- We need commercial support by CAM software and CNC machine tools now



Relevance to MBE and TDP

- STEP-NC is a rich data model for machining operations that is the “model base” for the production part of the enterprise
- STEP-NC is a published format that is portable across machines from different vendors and can be sensibly archived or outsourced later

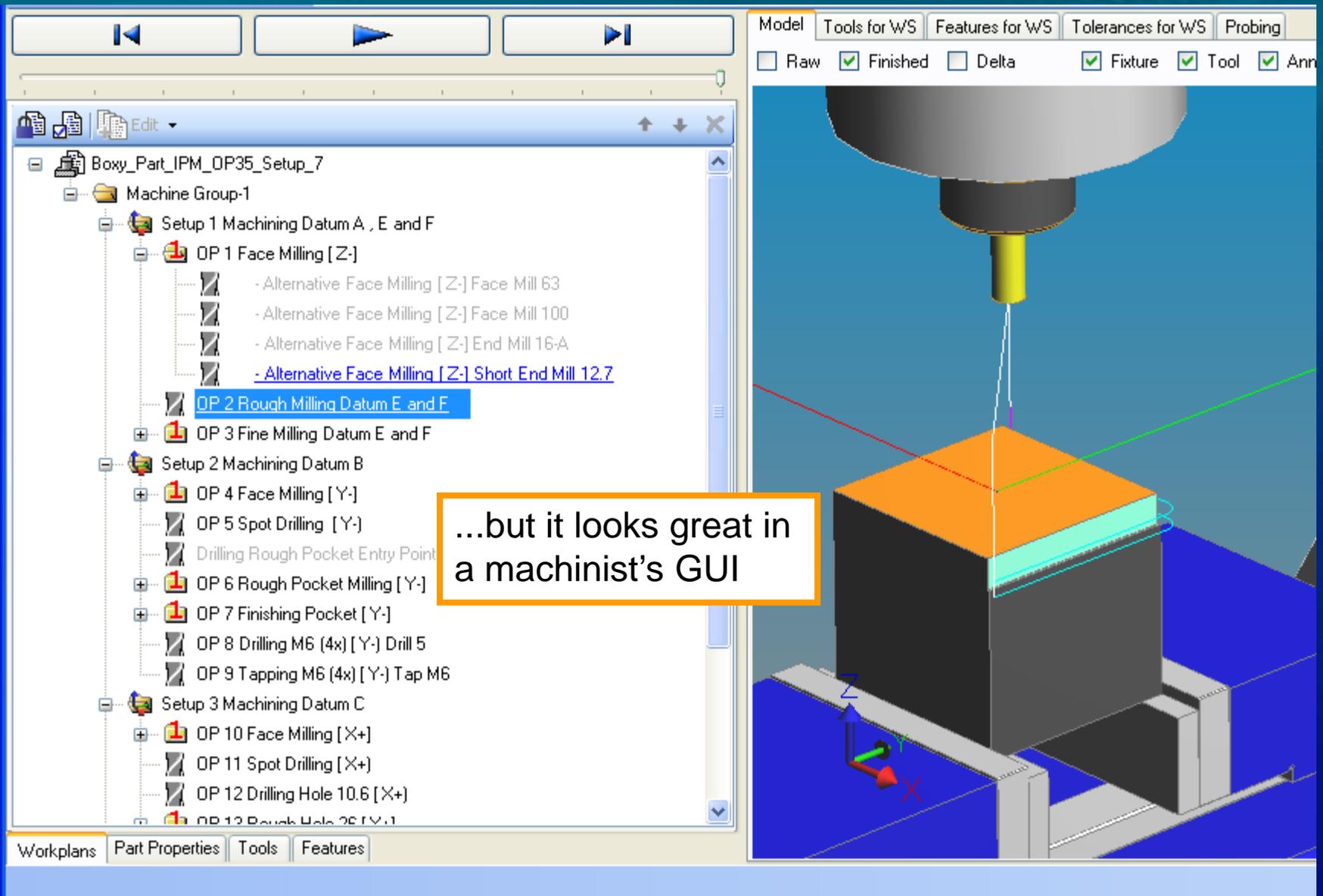


What STEP-NC Looks Like

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  schema="integrated_cnc_schema">
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  <exp:name>Boxy_Part_3-Axis_Machining_7_Setups_NIST</exp:name>
  <exp:time_stamp>2010-06-11T16:54:07-04:00</exp:time_stamp>
  <exp:author>STEP-NC Maker 3.0</exp:author>
  <exp:organization />
  <exp:preprocessor_version>ST-DEVELOPER v13</exp:preprocessor_version>
  <exp:originating_system>Various</exp:originating_system>
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* Application object: PROJECT (id10)
* MAIN_WORKPLAN: id10, id11, id12, id155534
* ITS_WORKPIECES [*]: id10, id13, id2612
* ITS_ID: id10, id14, id15, ['Mastercam Export']
-->
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- <Process_product_association id="id11" Name="" Description="" Process="id12">
- <Defined_product>
  <Product_definition ref="id10" xsi:nil="true" />
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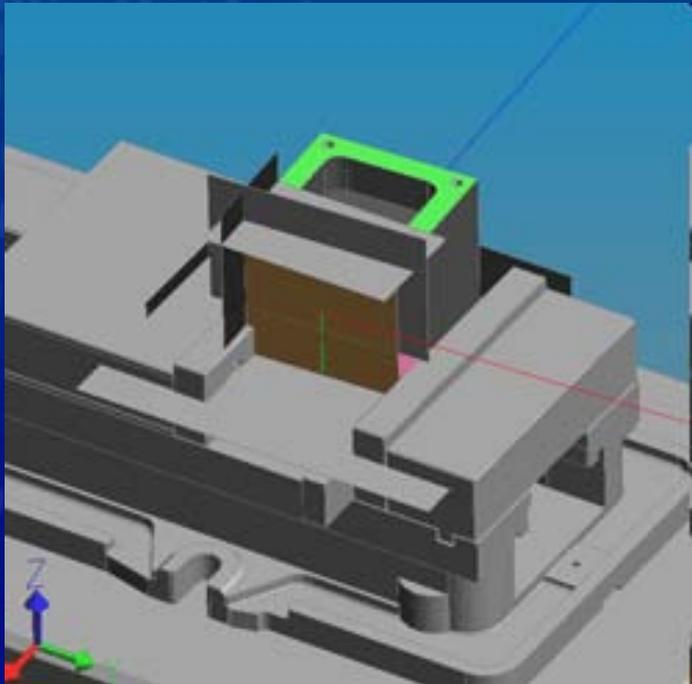
Not a hand-editable
format...





What's Been Done

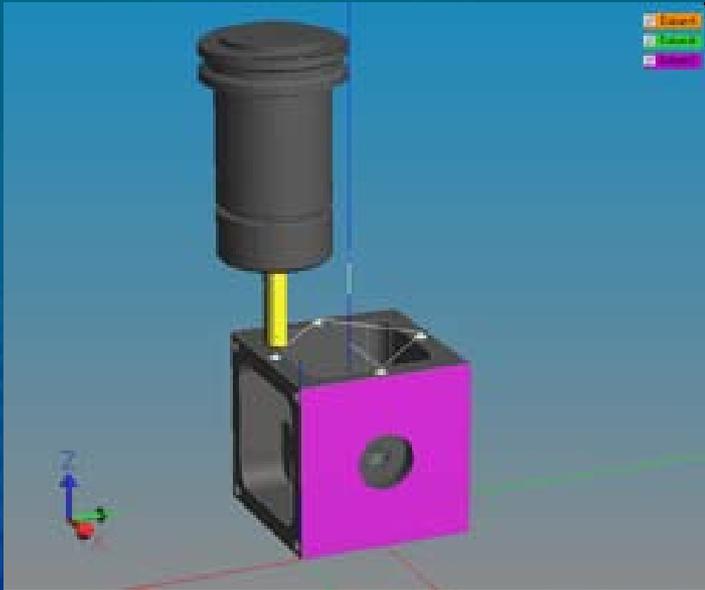
- Pilot projects over the past ten years have shown various benefits of STEP-NC



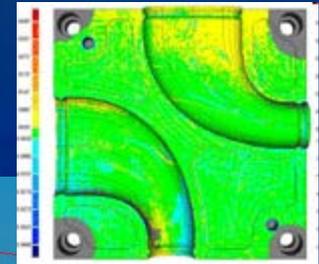
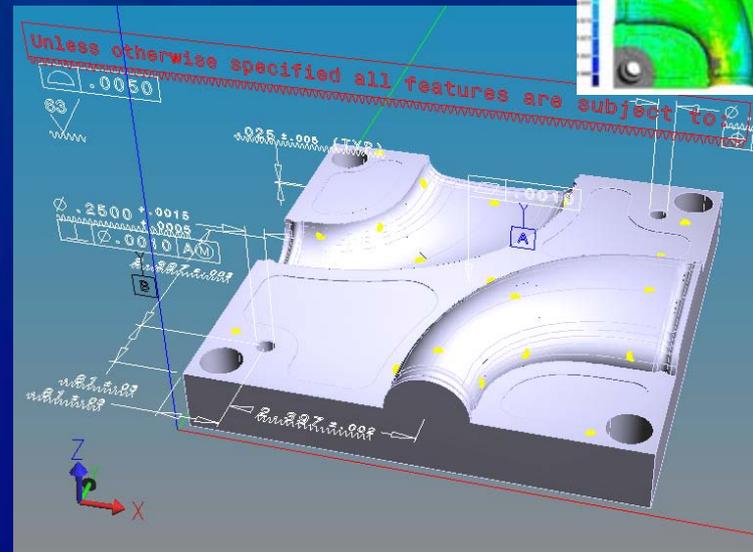
Boeing/Renton, October 2010:
"Boxy" gear box test, showing
additional setup measurement
geometry for the fixture and part
datums created using a Faro arm

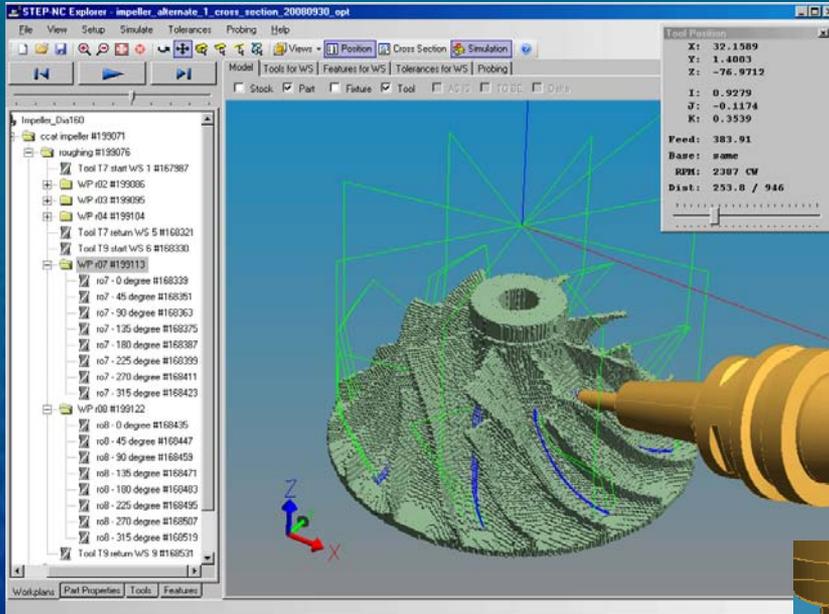


NIST, June 2010: “Boxy” data set, with seven setups for three-axis machining, and work coordinates set to corners of the part



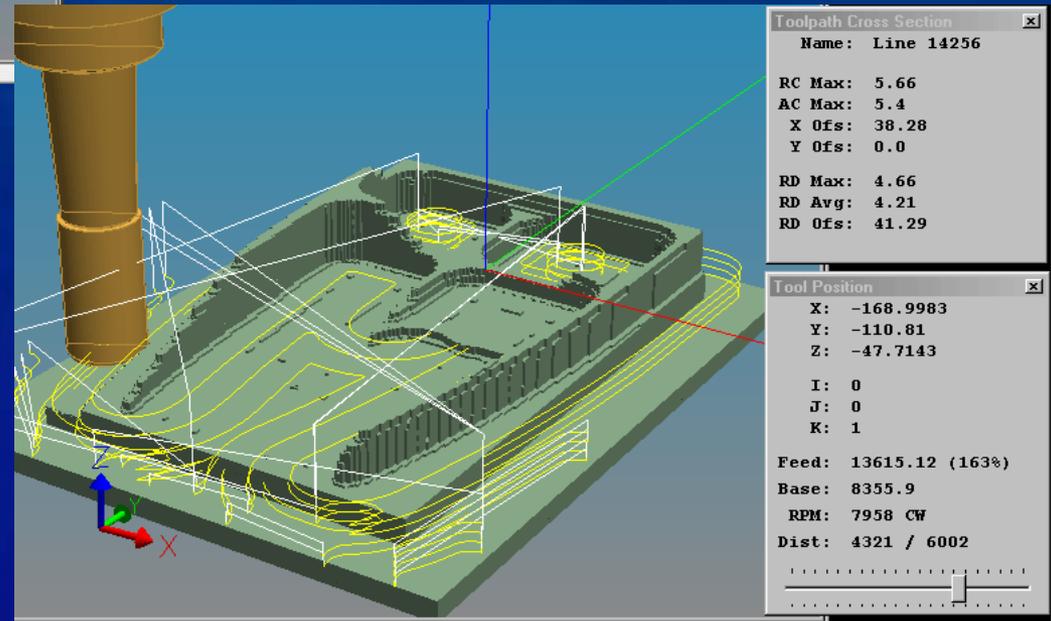
Renton, Washington 2009: AP203 E2 tolerance annotations imported from Catia; measurement results from Mitutoyo; machining from same data at Boeing, NIST, CCAT, KTH/Sweden, Scania





Connecticut Center for Advanced Technology: Five-axis toolpath correction on impeller using on-machine probing

Sandvik Tooling, Sweden:
Feed and Speed Optimization
with Boeing algorithm using
cutter cross-sectional area



Pilot Participants

- End Users: Boeing, CCAT, Pratt & Whitney, Scania, Watervliet, NASA JPL
- Vendors: Fanuc, Siemens, MasterCAM, GibbsCAM, Unigraphics, STEP Tools
- Universities: RPI/US, Bath/UK, Toulouse/France, KTH/Sweden
- Last DoD participant was Watervliet in 2000; need DoD part and site!



What We Need To Do

- Priority #1: Get commercial support for STEP-NC by CAM, CNC vendors
- Use DoD as a customer and show value of STEP-NC for MBE and TDP
 - MBE value: speed up setup time for low-volume production; optimize speed and feed
 - TDP value: move production data between facilities, customize for local operations
- Let's get DoD on board and make standard production data formats a reality

