EES Prototype Demonstration on CMP System

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Purpose of the Prototype Demonstration

1 . Study / Evaluate any improvements / concerns / issues of incorporating EES (Equipment Engineering System)
   1) Actual installation to 200mm CMP in production line

2. Install and use EES Capability from shipment and watch for the effectiveness
   1) Confirm effectiveness of On-Site Ramp up using EES capability implemented from shipment

3. Evaluate EES effectiveness based on EE data from production line
   1) Try to track any trends from EE data and find effective measure to improve Tool performance

Each Role for EES Prototype system

Selete

Fab Layer (Contents)
Runessas Technologies
Nissei Electronics
EBARA

Application layer
(Platform)
Meidensha

Data Layer
(Infrastructure)
EBARA

・ DEE Analysis System
・ Process Data Analysis System
・ Tool diagnosis system
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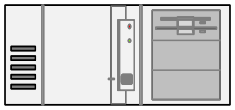
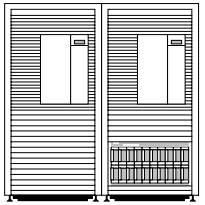
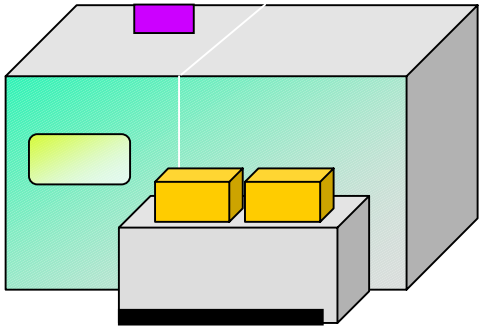
Logger





Data Server



CMP

Schedule

1．Engineering Concept

- June, 2002 to July, 2002

2．Detailed Engineering and Installation

- August, 2002 to October, 2002

3．Testing at Tool supplier (EBARA)

- November, 2002

4．On-Site Ramp up at production line

- December, 2002 to January, 2003

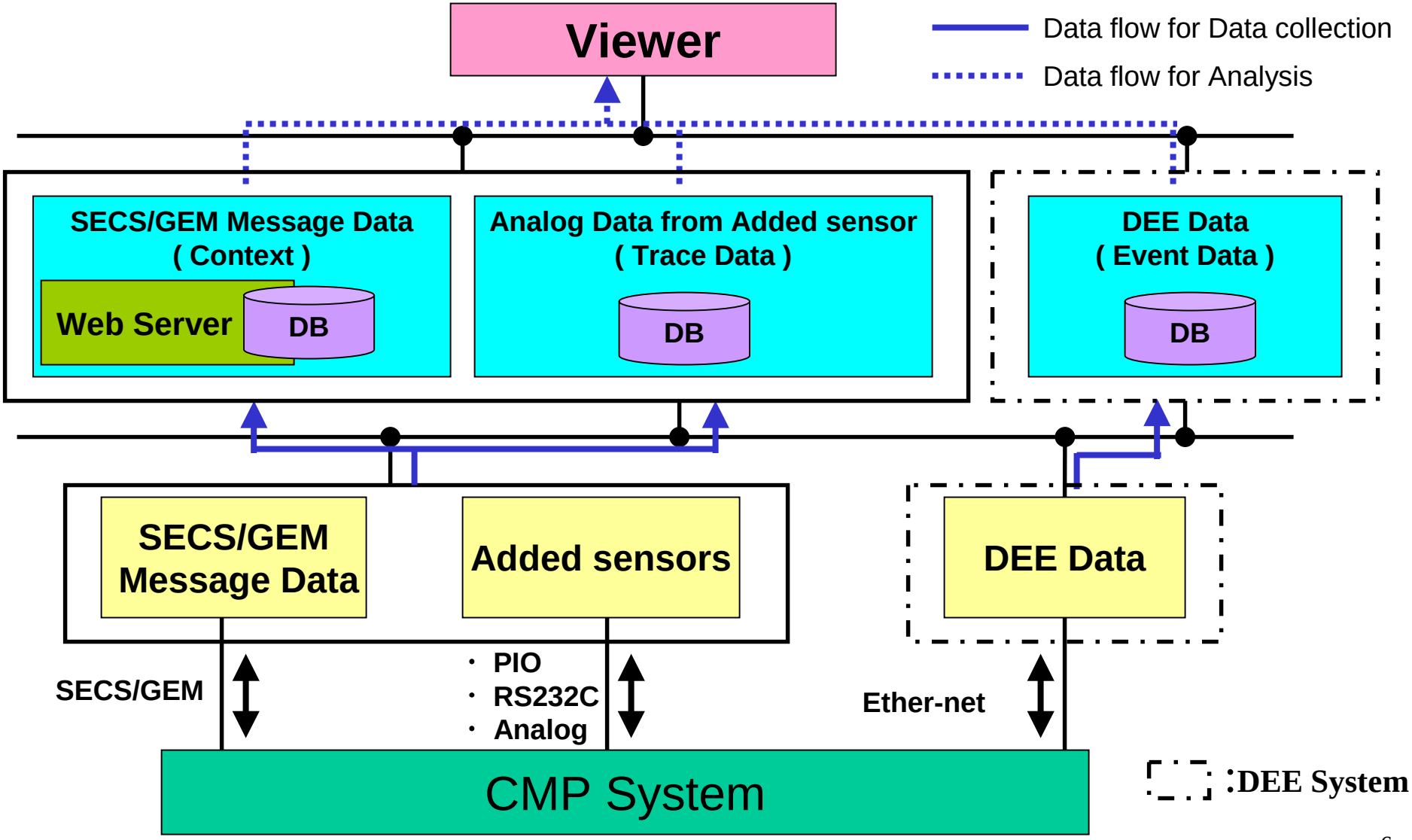
5．In Operation

- Since February, 2003

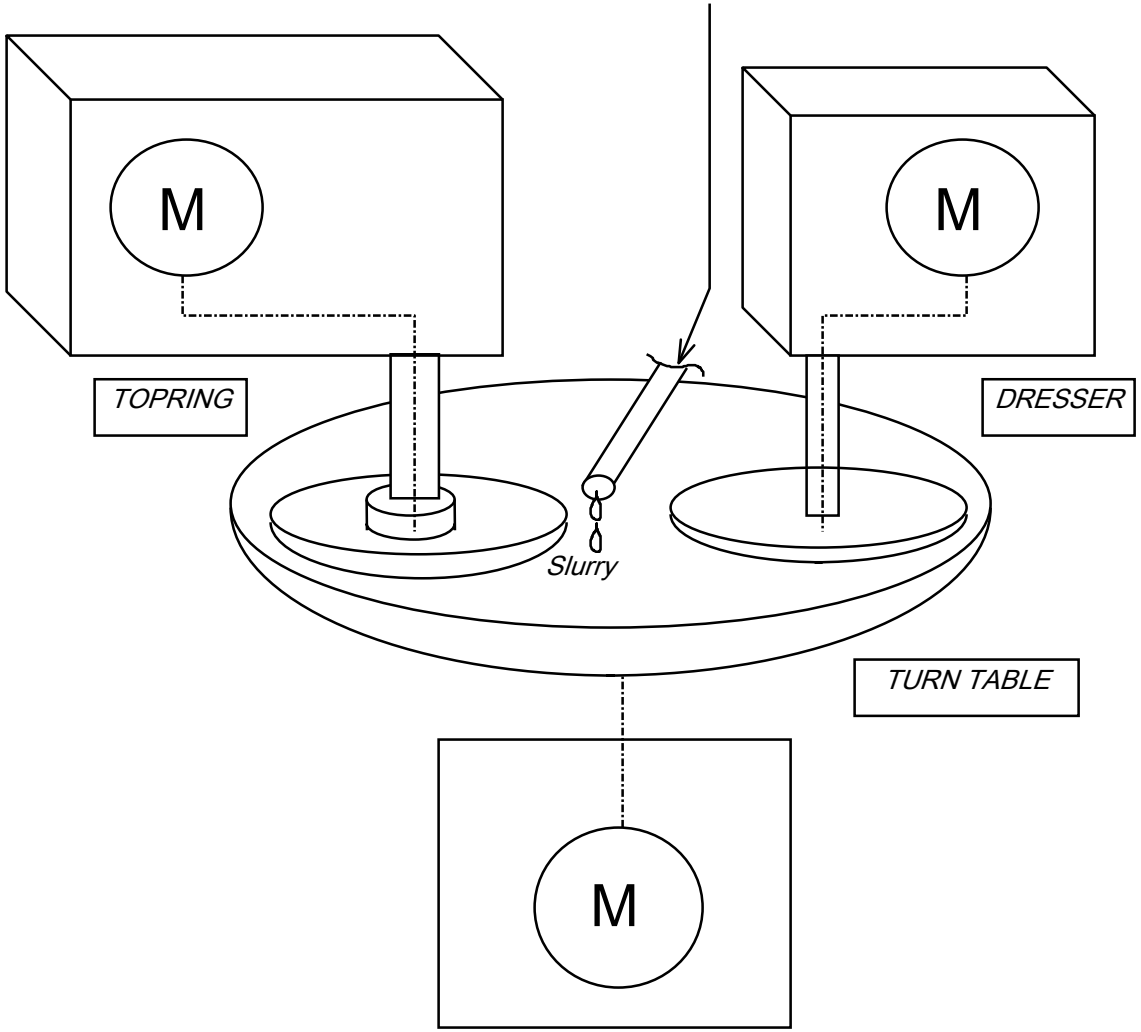
Data type

1. **Trace Data**
   1) Analog data from sensors added at Points of Use
2. **Event Data**
   1) DEE Data through Ether-net
   2) Original format was used between Tool and Logger
3. **Context**
   1) SECS / GEM Format

EES Prototype Configuration



Detail of Polishing Unit



List of Monitored Process Parameters

1. **Polish Head**

Description	*Source of the Data*
1) Rotation Speed	Recipe Setting
2) Down Force	Added Sensor (100msec)
3) Retainer Ring Pressure	Added Sensor (100msec)
4) Backside Pressure	Added Sensor (100msec)
5) Wf Chuck Vacuum Pressure	Added Sensor (100msec)
6) Torque from Polish Head	Added Sensor (100msec)

List of Monitored Process Parameters

2. Conditioner

Description	*Source of the Data*
1) Rotation Speed	Recipe Setting
2) Down Force	Added Sensor (100msec)
3) Torque from Conditioner	Added Sensor (100msec)

List of Monitored Process Parameters

3. Turn Table

Description	*Source of the Data*
1) Rotation Speed	Recipe Setting
2) Atomizer N2 Pressure	Added Sensor (100msec)
3) Pad Temperature	Added Sensor (100msec)
4) Torque from Turn Table	Added Sensor (100msec)

DEE data consists of;

1. Tool Controller's task status
2. Operation Status of each Unit
3. Robot Position Information
4. I/O Information

DEE data Acquisition

1.How to acquire DEE Data

DEE data acquired by Event Driven are desirable.

However, in legacy tools, Event Driven acquisition method can't be usually implemented.

In this Prototype, DEE data are acquired by Cyclic sampling method.

2.Demerits of Cyclic Sampling Method

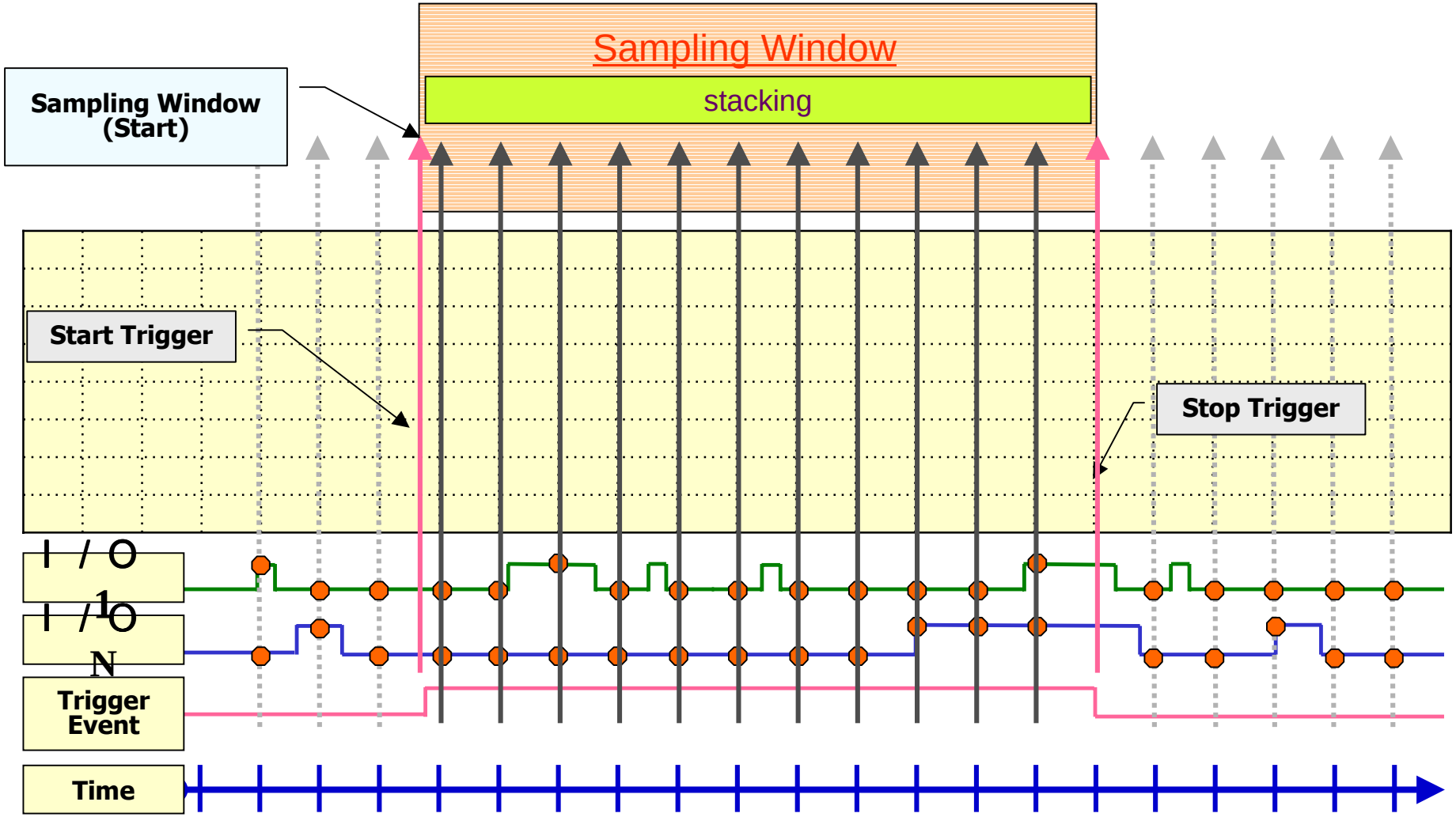
1)Increasing data volume

In general, DEE Data acquired by Event Driven is smaller than by Cyclic Sampling Method.

2)Event Catch Capability

It is possible that important events can't be caught.

DEE data Sampling Method

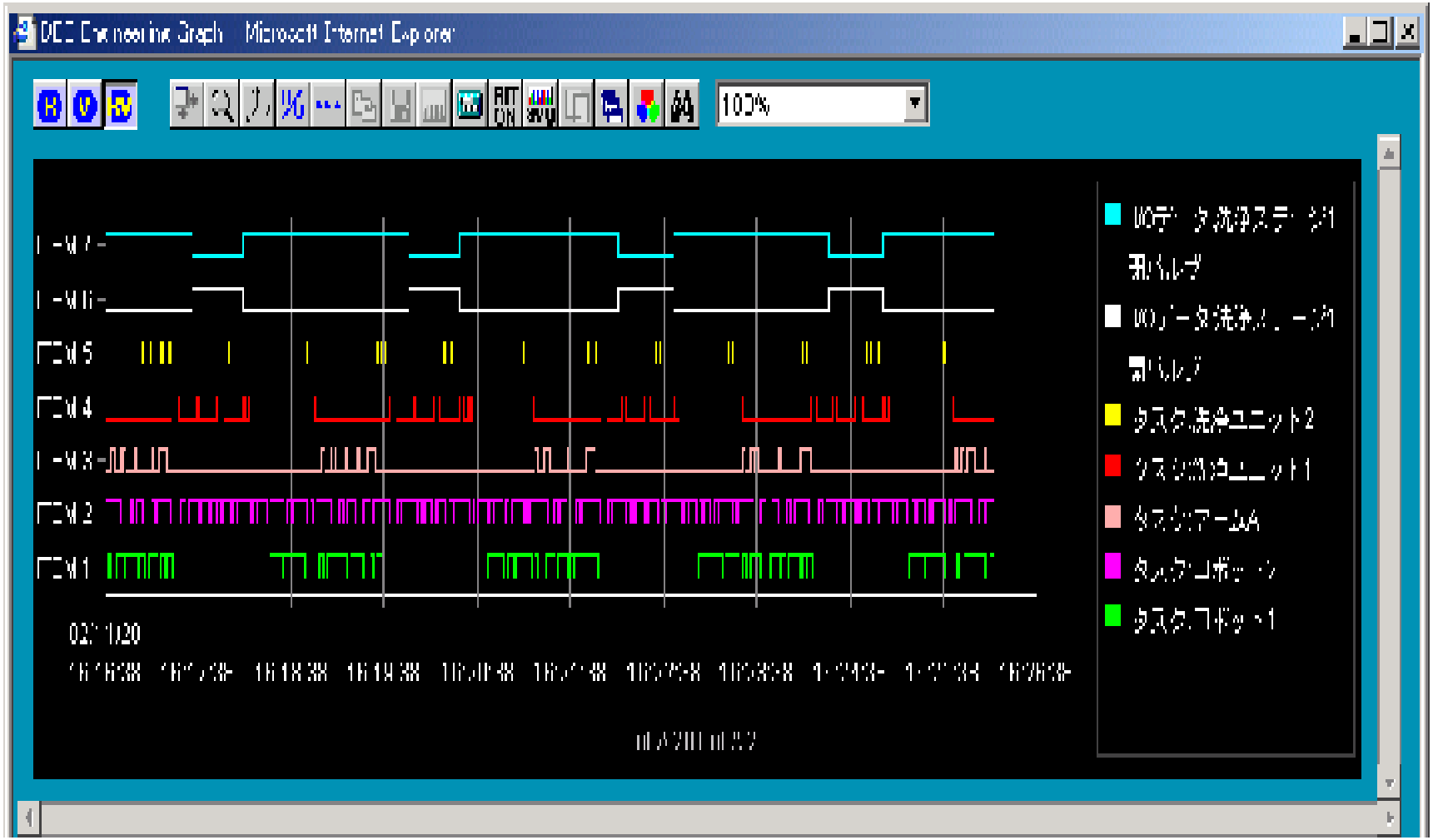


Key Points to implementation of DEE Acquisition Method in Legacy Tools

1. Minimize Any Modifications to Existing Tool Control Software
   1) Try to avoid to have any bugs causing unexpected Tool issues.
   2) Only New tasks are added with this Proto type without affecting any existing tasks.

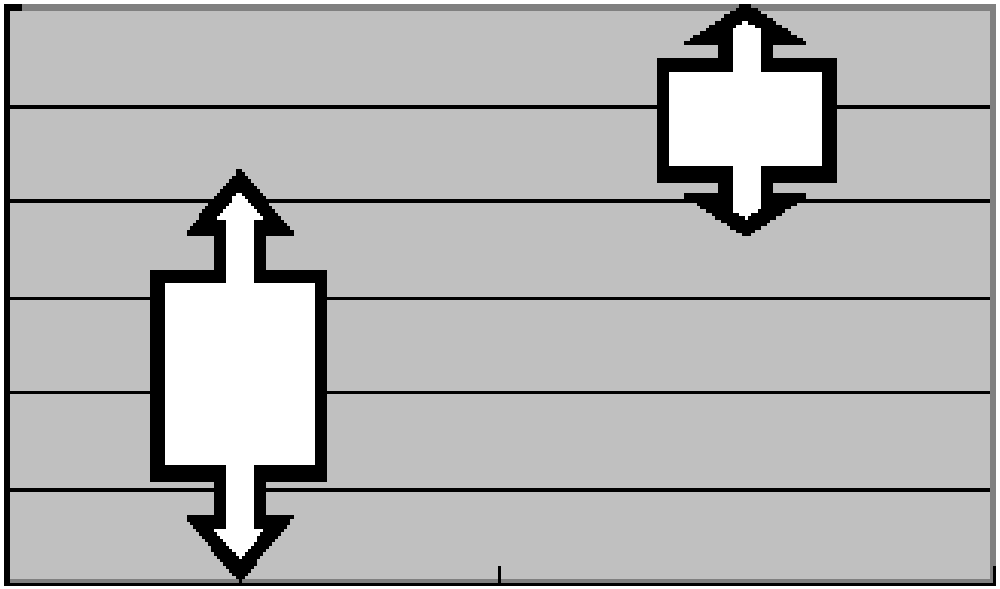
2. Prevent to have lower Tact Time
   1) EBARA found out that Tool Tact Time would drop down for 2-3% if we increase the sampling frequency up to double.

Example of DEE Data monitoring



Problem Encountered in Ramp up

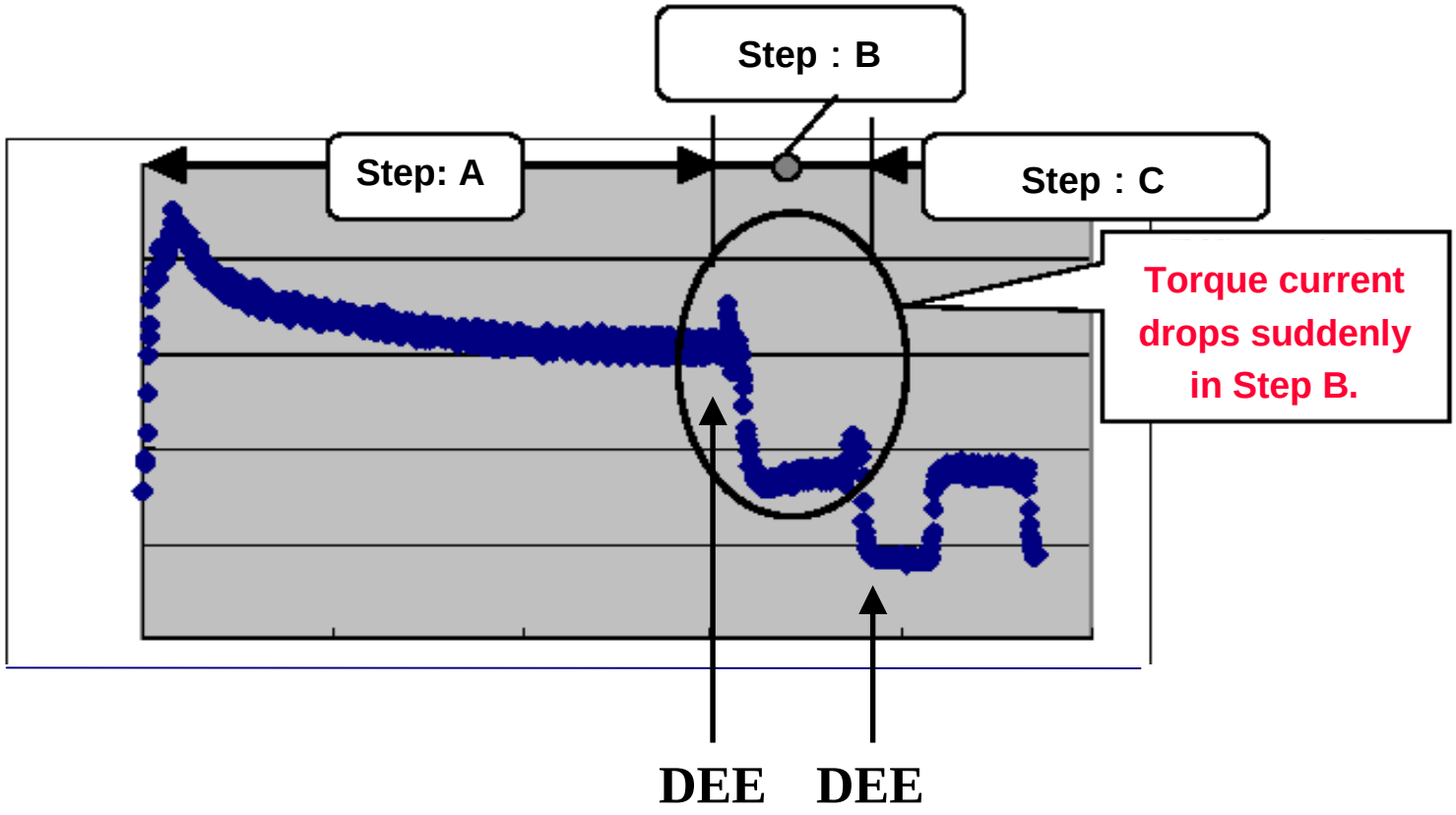
There was polish rate difference between Tool “A” and Tool “X.”



Tool:A **Tool:X**

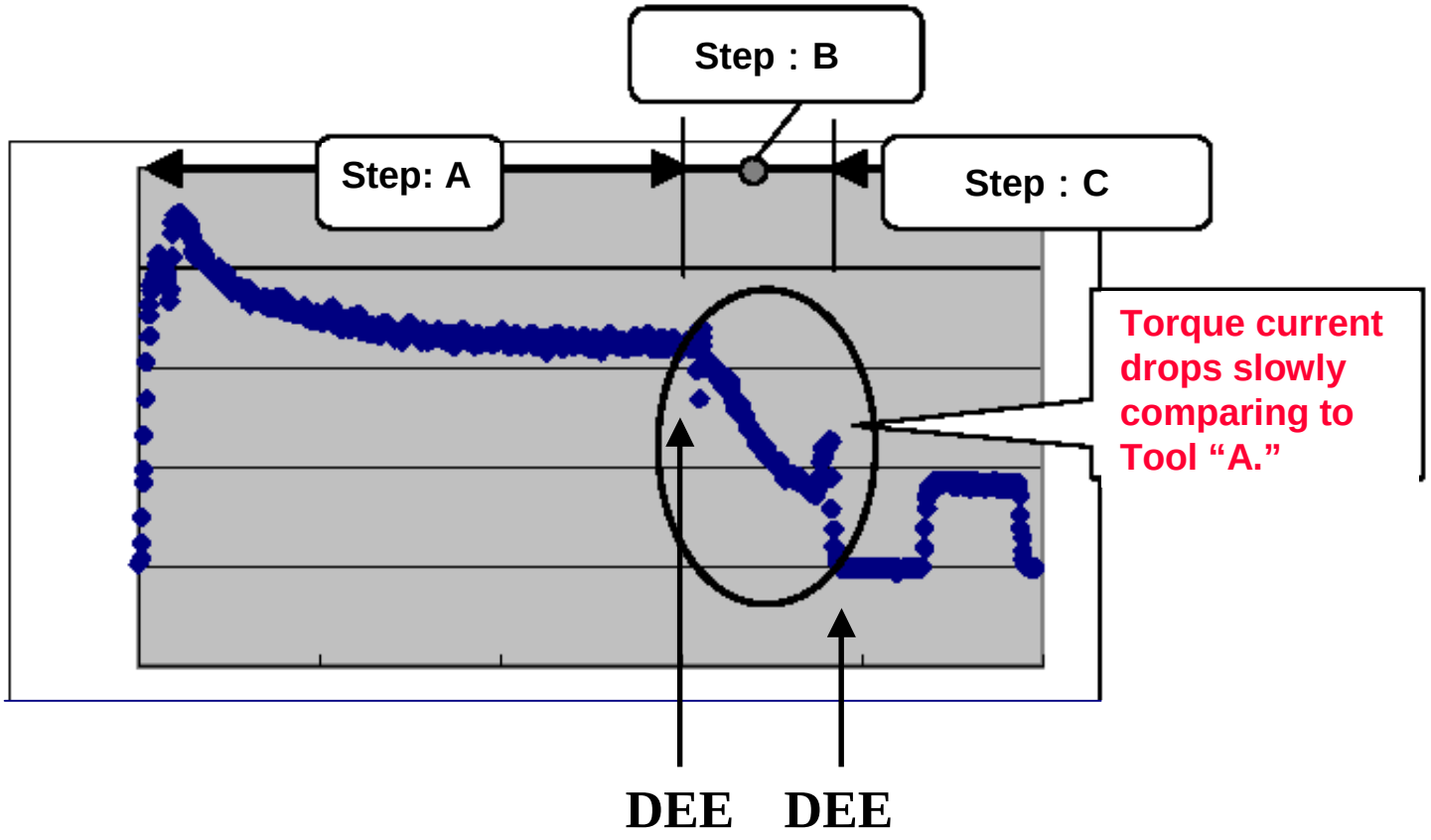
Problem Encountered in Ramp up

Polishing Head Torque Current from Tool “A”



Problem Encountered in Ramp up

Polishing Head Torque Current from Tool “X”



On-Going Development

1. Development of the Contents

Valuable contents has to be developed using EE data.

1)Consumables Lifetime management

2)Establish Most Effective Preventive Maintenance

3)Improve APC Capability

2. Data Accumulation and Analysis

It is important to accumulate and analyze the EE Data so that beneficial contents can be developed.

Summary

1.Ramp up Support using EE Data

Example for adjustment of machine difference of polishing rate in ramp up shows that Using EE data make On-Site installation smoother.

2.Design using EE Data

Tool reliability is increased by Utilizing EE Data

e.g., operation time of actuator obtained from DEE

3.Process Improvement using EE Data

Process performance can be effectively Improved by using combination of Trace data, DEE data and Context data.