Changeover Tool

(COT2-device)

- **Justification of the need**
- **Solution**
- **Technical summary**

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July 2014

Justification of the need

Size-changeovers and Manufacturing landscape

FACTS to be considered:

- To achieve world-class OEE (Overall Equipment Effectiveness) of 85% or higher, unscheduled stoppages and “Stop & Go” line operation must be minimized
- Automated production lines are very sensitive to “Stop & Go” operation (it dramatically decreases OEE performance of entire production line and creates a big amount of scrap)
- Machine “tweaking” after changeover is one of key contributors to decreased OEE
- Inexperienced operators are unable to effectively cope with changeover complexity (machine upgrades are typically not properly documented)
- In most cases every operator has its own “best changeover settings”
- Manufacturing management is under constant pressure to deliver high productivity: Old-school approach “Learn from mistakes” it is not acceptable any longer
- Tremendous knowledge and experience of Baby-boomers will go with them when they retire. Capturing and formalizing their experience is of great value for the company

Why changeovers are always challenging

Production floor reality (concerns of both operators & managers)

- There are three main reasons why size changeovers are always difficult and unpredictable:
  1. **Significant number** of changeover locations (it can easily reach 50 per machine)
  2. **Multiple settings** at each changeover location (up to 20 different products)
  3. **Working under pressure** to restore full line efficiency as fast as possible

- Kaizen training (waste elimination) can not address production issues with a huge financial impact:
  - Creation of scrap caused by machine tweaking after size-changeover
  - Manufacturing of the product of inferior quality during ramp-up period

- Only way machine operator gains adequate changeover experience is “on-machine training” (slow)

- Changeover “learning curve” of a new machine operator is much longer then expected

- Operator’s cross-training to perform changeovers of multiple machines could be counterproductive

Desired solution:

Device that will provide interactive step-by-step operator guidance

Changeover issues: Not so obvious consequences

Traditionally, changeovers are viewed as a necessary evil . . .

- Lengthy changeovers result in machine downtime
- Idle equipment reduces productivity of valuable human resources
- Changeovers are complex and require a high degree of skill and precision
- Frequent adjustments upset the delicate balance of machine settings,
- Repeated adjustments also increase the risk of making out-of-spec products
- Scrap is generated during the fine tuning phase of a changeover
- Long lead times reduce ability to service customers
- Poor Forecast Accuracy

Magnitude of Changeover Opportunity is **BIG** (in millions of $/year – conservative estimate)

	Reduced Change-over time ($MM)	**Faster** Ramp-up to full speed ($MM)	**Reduced** Scrap ($MM)	**Reduced** Training time ($MM)	**TOTAL savings** ($MM)
Major US Food Company	**2**	**3**	**10**	**5**	**20**

“Ideal changeover solution” should deliver

- **Minimal OEE decrease**
- **Predictable down-time**
- **NO scrap caused by changeover**
- **NO influence of operator’s changeover experience**
- **Efficient operator training (no re-training)**
- **Attractive ROI (short pay-back time)**

Bottom line:

Companies can **save millions every year** by better changeover practices

Solution

Promise: "Changeover Tool" (COT2-device) will deliver

Changeover ISSUES: → **COT2-device** → **Turn-key SOLUTION**

Machine changeovers ALWAYS create:

- **Reduced OEE of entire line**
- **Unnecessary Scrap**
- **Out-of-spec products**
- **Unpredictable line downtime**
- **Dependence on operator's skills**
- **Increased inventories**
- **Longer lead times**
- **Outside storage costs**

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COT2-device **solves ALL potential issues** of machine changeovers:

- **Line OEE is visibly improved**
- **No Scrap**
- **No out-of-spec products**
- **No machine "tweaking"**
- **No Ramp-up time**
- **No operator's skills needed**
- **Very predictable line downtime**
- **Fully guided adjustments**
- **10 min new operator training**

How #1: Location-aware wireless distance measurement

COT2-Sensor (wireless)

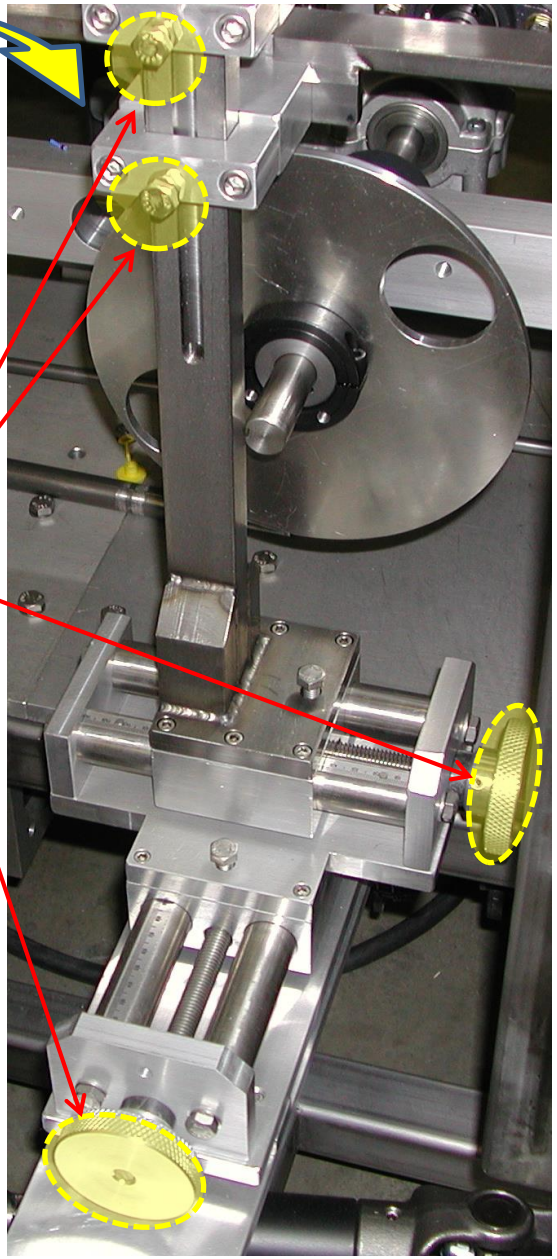
Command

Distance info

Location info

COT2-Controller

Changeover adjustments
(can be enabled for COT2-device)



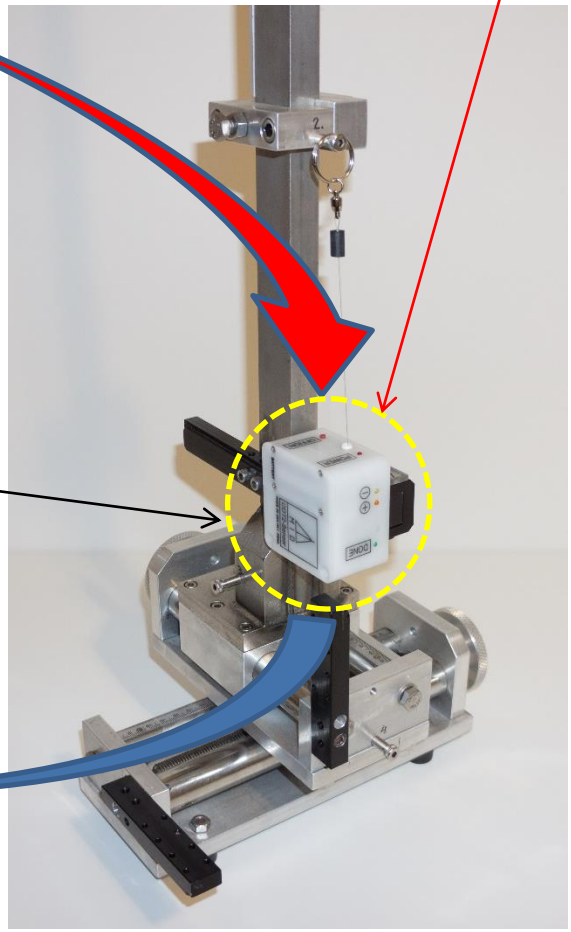
How #2: "Changeover Tool" – functionality explained

Wireless streaming CONTROLLER to SENSOR
(update: 1sec)
- Dynamically updates COT-sensor LED indicators
- Remotely shuts OFF COT-sensor due to inactivity

COT2-Controller

COT2-Sensor

Distance: up to 100m (300Ft)



Wireless streaming SENSOR to CONTROLLER
(update: 1 sec)
- Automatically updates Sensor Location
- Controls adjustment sequence (RANDOM or STRICT)
- Dynamically updates distance reading

Technical summary

Technical summary (1)

- **Any new or old machine can use COT2-device**
- **Deployment of COT2-device will not change operational safety of the machine**
- **COT2-device serves up to 5 different machines** (up to 50 locations per machine – total 250 locations)
- **COT2-device supports up to 50 different product sizes**
- **COT2-device supports two different adjustment sequences** (for each of 5 machines):
  1. RANDOM (i.e. 1, 13, 8, 2, 4, ….)
  2. STRICT ascending sequence (i.e. 1, 2, 3, 4, 5, …)
- **Operator is GUIDED to make accurate and fast adjustments** (typically 1 to 5 minutes per location)
- **COT2-device allows Hands-free operation** (operator can use both hands for changeover adjustments)
- **Operator training is extremely efficient** (10 minutes or less)
- **Operator does not need any computer skills**
- **HELP function “teaches” an operator how to perform perfect adjustments**

Technical summary (2)

- **No adjustment location can be missed or skipped** (COT2-device displays adjustment process)
- **No misplacement or location misreading errors** (changeover location is automatically recognized)
- **Adjustments procedure could be interrupted at any point** (as long COT2-controller is powered)
- **Location-aware brackets are made of anodized Aluminum or Stainless steel** (wash-down capable)
- **COT2-sensor can operate up to 100m (300ft) away from the COT2-controller**
- **COT2-device is resilient to strong mechanical shocks and vibration** (no moving parts)
- **Changeover data safety is very high** (any successful changeover is backed-up on the SD card)
- **Interchangeability of COT2-sensors between different COT2-devices is supported**
- **One-time installation of location-aware brackets requires 4-10 hours** (scheduled down-time)