SMART FACTORY

Scalable Factory Automation for Manufacturing Specialty Chemicals
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Introduction
We develop, produce and sell specialty chemicals and tailor-made solutions for our customers in the following industrial sectors and markets all over the world:

- Textile industry
- Textile care - industrial laundries
- Paints & coatings industry
- Construction & building industry
- Consumer care industry
- Paper and pulp industry
- Construction material industry
- Rapid prototyping and mold making industry
CHT GROUP - IN A NUT SHELL

- WORLDWIDE 29 COMPANIES
- AROUND 2,200 EMPLOYEES WORLDWIDE
- WORLDWIDE MORE THAN 9,000 CUSTOMERS
- MORE THAN 5,000 PRODUCTS
- PRODUCTION OF APPROX. 140,000 TONNES OF AUXILIARIES, DYESTUFFS AND ADDITIVES IN 24 PRODUCTION SITES
- REVENUE IN 2016 OF € 420 MILLION
WE ARE AROUND THE WORLD

PRODUCTION SITES
- CHT Russia
  - Moskau
- CHT Turkey
  - Istanbul
- CHT Pakistan
  - Lahore
- CHT India
  - Mumbai
  - Taloja
- CHT China
  - Shanghai
  - Hongkong
- CHT South Africa
  - Durban
- CHT Australia
  - Melbourne

SALES OFFICES
- BEZEMA Tunisie
  - Bou Argoub
- ICM Silicone Products & Siovation
  - Cassopolis
- Qsi
  - Richmond
- CHT Mexico
  - Torreón
  - Lerma
- CHT Colombiana
  - Medellin
  - Bogota
- CHT Peruana
  - Lima
- CHT Brasil
  - Cajamar
- CHT Quimipel
  - Piracaia
- ACC Amber Silicones
  - Tianjin
- Guenther Schaetzle, TK
DEFINITION

Industry 4.0
INDUSTRY 4.0

Powerful linkage of production equipment with modern IT and communication technology. Intelligent automation network for production and logistics plants.

SMART FACTORY

Process flow wherein production plants and logistics systems communicate and teamwork without human interaction or control. Technical basic principles are cyber physical systems communicating with each other using the internet of things.

CYBER PHYSICAL SYSTEMS

Systems, plants or machines which use sensors for measuring their status data or information of surrounding systems. They share these data via networks. Machines therefore exist of their physical body and their virtual twin. Using these virtual data networks makes it easy and quick to control systems and optimize them without major interference to running value adding processes.
CHEMICAL PRODUCTION

Producing chemical products using continuous processes or batch processes in sophisticated plants. High tech monitoring and control equipment ensure the

⇒ High demands on process safety

BATCH PRODUCTION IN CHEMICAL INDUSTRY

In batch production processes the reactors are loaded, the material is processed and the system unloaded in order to generate a homogenous quality mass for each batch. This is the

⇒ Main difference to machine industry.

BATCH SIZE ONE

\[
\frac{5000 \text{ products}}{9000 \text{ customers}} = \text{likely to be batch size 1}
\]
MOTIVATION

For Change to Smart Factory
STATUS 2010

▷ Old SPC controls, no more spares available
▷ Text visualization, confusing HMI (human machine interfaces)
▷ Rudimental process data acquisition
▷ Historically grown overloaded program codes, dead codes

NEW REQUIREMENTS

▷ Plant safety and process safety
▷ Quality consistency
▷ Performance availability
▷ Flexibility
▷ Optimization of processes

→ Change required!
REALIZATION

Change Management
REALIZATION - 3 OPTIONS TO CONSIDER

**Tradition**
Renewal of existing control system without further options

**Revolution**
Disruptive change to a complex PLC system for chemical processes

**Evolution**
Adaption and stepwise migration of a validated process control system successfully used in other industry branches
REALIZATION - EACH OPTIONS HAS A CERTAIN RISK

Tradition
Renewal of existing control system without further options

Revolution
Disruptive change to a complex PLC system for chemical processes

Evolution
Adaption and stepwise migration of a validated process control system successfully used in other industry branches
REALIZATION

MACHINE INDUSTRY
Factory automation in product manufacturing. I.e. automotive

CHEMICAL INDUSTRY
Scalable factory automation for manufacturing specialty chemicals.

Evolution
Adaption

Special requirements for chemical production

• Validated data
• Safety for process and human
• Process control
• Monitoring
• Reproducibility
• Data integrity
# ROADMAP TO IMPLEMENTATION

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ROADMAP TO IMPLEMENTATION

Condition Monitoring

- State monitoring
- Alarm systems
- Extranet remote access
- Mobile plants
- Wireless systems
- Ambulant sensors

Energy Monitoring

- Energy management
- Special sensors
- Calculation models
- Simulations

Process Data Acquisition

- Data Mining
- Dashboard
- Data research
- Data export
- Data dependency logics

Manufacture Executing System

- Production planning
- Energy saving concepts
- Less hazardous chemicals on site
- Optimization
  - Production processes
  - Logistics processes
CHANGE MANAGEMENT IN OUR OWN HANDS

- Experience
- Communication
- Responsibility
- Identification
VIEWS FROM PRODUCTION
CURRENT SIZE OF THE SYSTEM

Plants 101
Servers 11
APC 19
PPC/HMI 61
Controller 106
Switches 36
I/Os 27,000
VIEWS FROM PRODUCTION

10.06.2018 Guenther Schaetzle, TK
VIEWS FROM PRODUCTION
Condition monitoring

Views from Production

- EtherNet/IP
- Profibus DP
- Modbus TCP
- Electricity, overload
- Flowrate, amounts
- Level, leakage
- Temperature, pressure, quality
- Fire alarm
- Manual input
Energy monitoring

VIEWS FROM PRODUCTION

- EtherNet/IP
- Profibus DP
- Modbus TCP
- Currents, frequency
- Flowrate, amount
- Level
- Temperature, Pressure, quality
- Load shedding
- Manual input
ADDED VALUE

Project Benefits
ADDED VALUE

Technology

1. Standardization
2. Modularity
3. Flexibility, Scalability
4. Process Assessments
5. Redundancies, Availability
6. Safety & Performance

Management & Operation

1. Change Management
2. Risk Reduction
3. In Situ Process
4. Linear Development
5. Acceptance
6. Trust
CONCLUSIONS

Project Qualification
INDUSTRY 4.0 QUALIFICATION

7 Use Cases Industry 4.0, ref Dr.Ing. Tauchnitz, NAMUR.

1. Plug and play for field devices ✓
2. Consistent current documentation ✓
3. Modularization in Package Units ✓
4. Controller Performance Management ✓
5. Advanced Process Control ✓
6. Plant Asset Management ✓
7. Site to Site Transfer ✓
**Prozesstechnik in Multifunktionsanlagen erneuert**

Schrittweise Migration und paralleler Betrieb von Aprol und Altsystem

If you always do what you always did - You will always get what you always got.
(Henry Ford)

It is not enough to take a bath. From time to time you need to change the water.
(Paul Schnitker)