UNIVERSITA DEGLI STUDI DI ROMA
Tor Vergata

"Tor Vergata" University of Rome
ING-IND/17 Research Group

IMPIANTI INDUSTRIALI Tor Vergata ROMA

XVI Summer School "Francesco Turco" Impianti Industriali Meccanici
Abano Terme (Padova, Italy) - 14-16 September 2011

UNIVERSITÀ DEGLI STUDI DI ROMA
Tor Vergata

Research Team Presentation

University members
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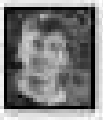

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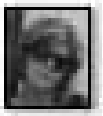

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7 PhDs are funded by private companies

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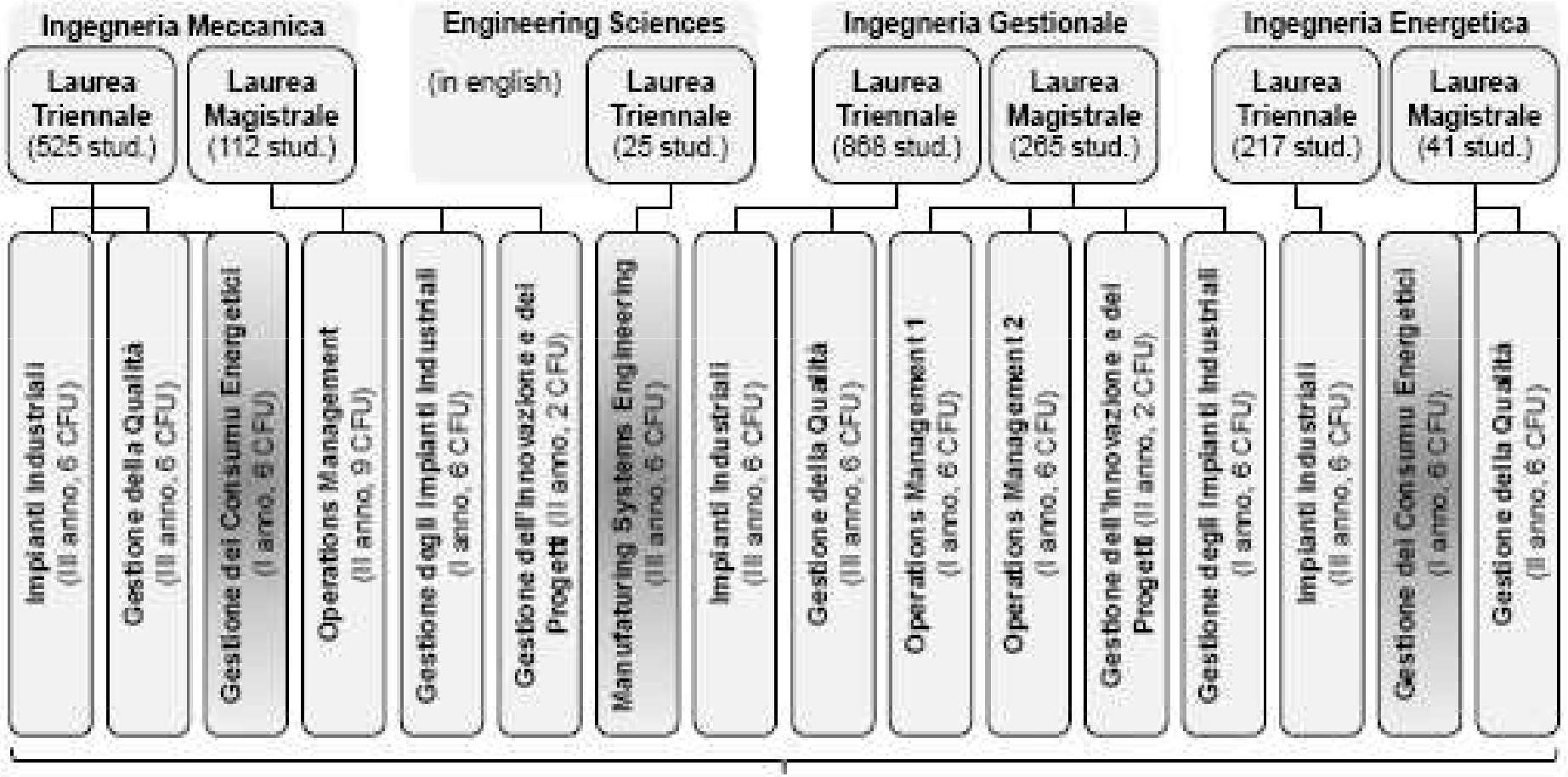
Teaching Activity

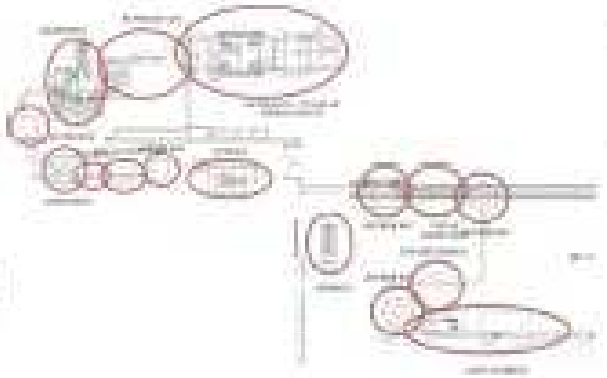


500 hours/year lectures – more than 270 thesis in the last 10 years

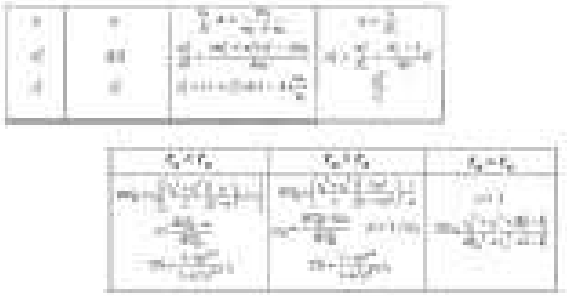
STARTING FROM 2013

Process modelling and optimization

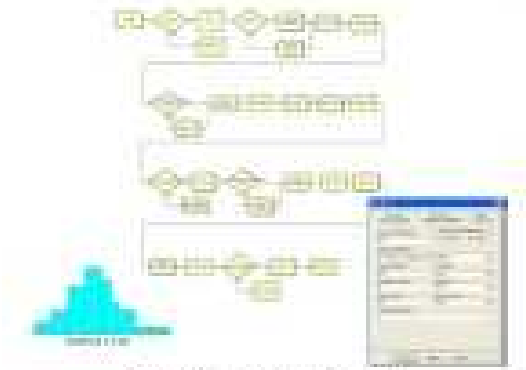
- Buffer Design for Availability in Pharmaceutical Sector



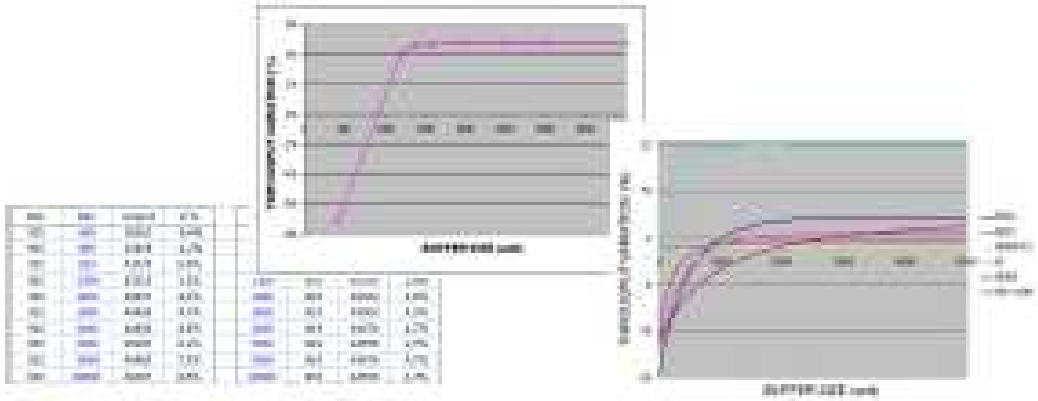
PROBLEM ANALYSIS & GENERALIZATION



MATHEMATICAL MODEL

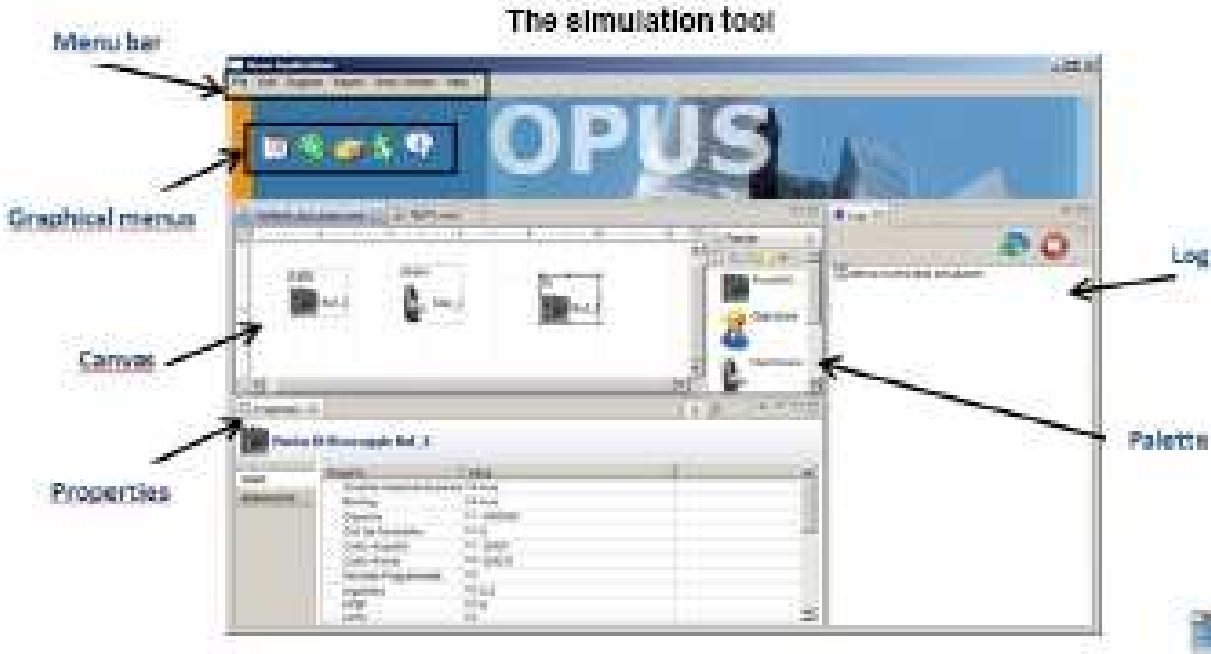


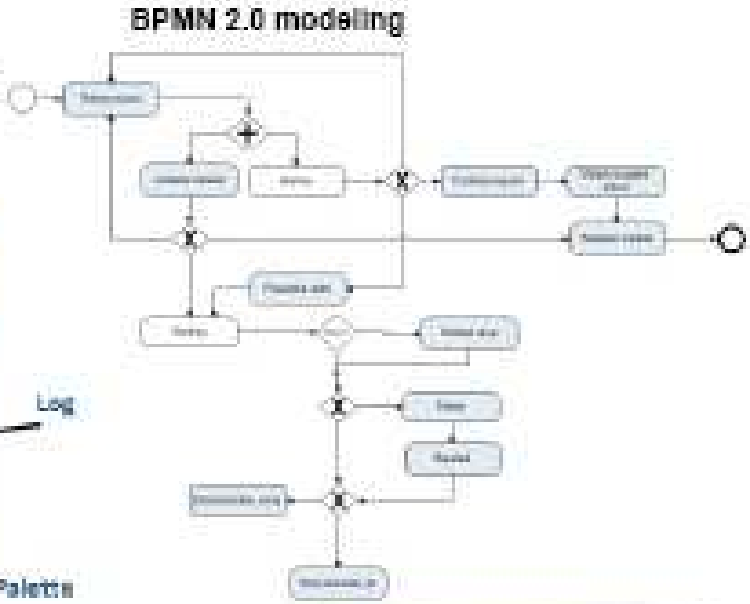
SIMULATION MODEL



RESULT ANALYSIS AND BUFFER SIZING

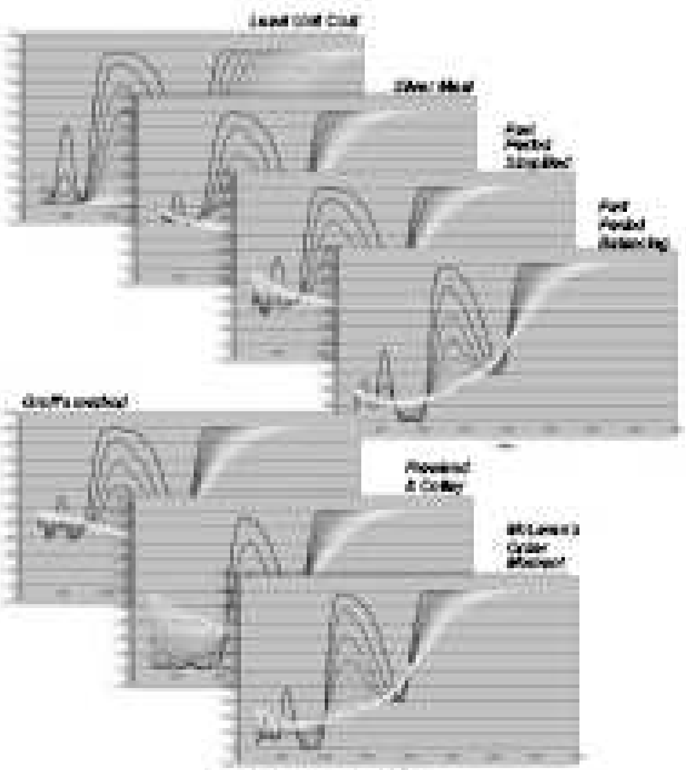
- The «OPUS» Project: a simulation tool embedding an operations management approach



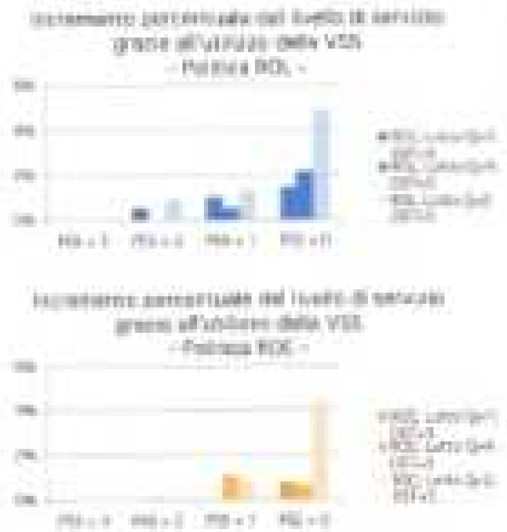


Bottiato, Giordano, Iannone, Scholotti, "A proposal for a standard framework for simulating and modeling manufacturing systems" Conference on "Sustainable Development: Industrial Practice, Education & Research", Monopoli, Bari (Italy), 14-15/06/2010

- Safety Stock & Lot Sizing Techniques



The «N» Effect



$$SL = 1 - \int_0^{\infty}\left[\frac{1}{\sqrt{2\pi}}\int_{k(t^*)}^{\infty}\exp\left(-\frac{z^2}{2}\right)dz\right]\cdot\left[\frac{1}{\sqrt{2\pi}}\int_{k(t^*-\varepsilon)}^{k(t^*+\varepsilon)}\exp\left(-\frac{z^2}{2}\right)dz\right]d(t^*)$$

$$s.t.\ \begin{cases} k = \dfrac{t - DT}{\sigma_{DA}} \\ k^* = \dfrac{t^* - \overline{DT} + DST}{\sigma_{DT}} \end{cases}$$

DST is measured in days, PSS in product units.
Delivery time: DT~N(15,[illegible])

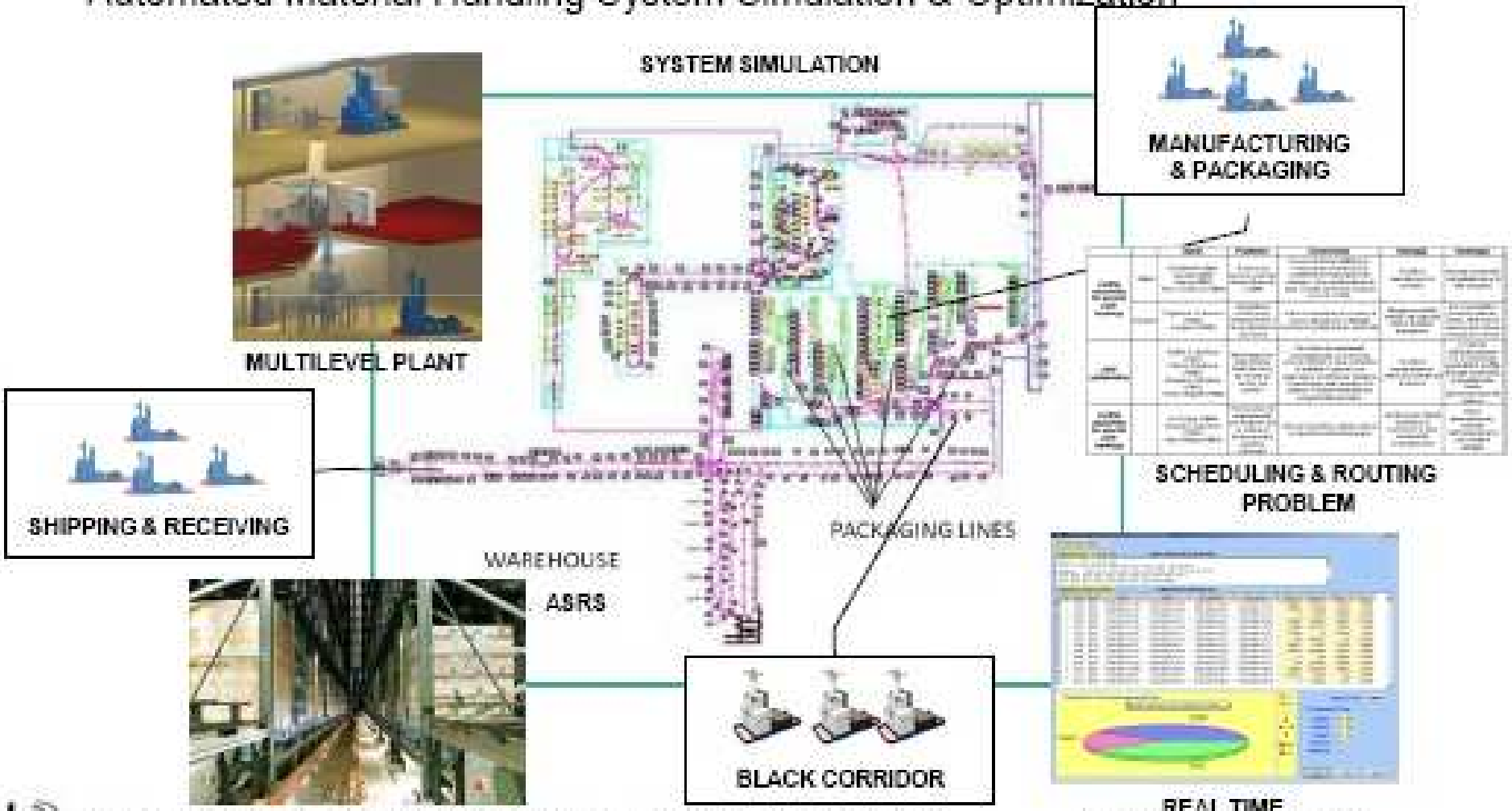
	[illegible]		[illegible]		[illegible]	
Target SL	DST (PSS =0)	PSS (DST =0)	DST (PSS =0)	PSS (DST =0)	DST (PSS =0)	PSS (DST =0)
[illegible]	0	0	0	0	0	0
55%	1	1	1	34	1	338
60%	1	1	1	48	1	414
65%	1	1	1	75	1	731
70%	1	1	1	95	1	[illegible]
75%	2	2	2	137	2	[illegible]
80%	2	2	2	158	2	[illegible]
85%	2	2	2	184	2	[illegible]
90%	2	3	2	248	2	[illegible]
95%	2	4	2	[illegible]	2	[illegible]
[illegible]	[illegible]	7	[illegible]	[illegible]	[illegible]	[illegible]

Bacharel, D'Aurizio, Croot, Schiraldi, «Analysis of the Performances of Heuristic Algorithms for the Unconstrained Single Item Lot Size Problem» Submitted to "the International Journal of Production Research", 2011

Nenni, Schiraldi, Van de Velde, "Determining safety stock with backlogging and delivery spare time", XVIII International Conference on Production Research Proceeding, ICPR - Salerno (Italy), 1-4/08/2005

Material Handling System

- Automated Material Handling System Simulation & Optimization



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Lean Management & Lean Safety

Lean Management

A SMED application with TPM way of thinking

"TPM SMED" develops SMED activities for set up reduction through TPM principle application, committing worker and creating a deep sense of ownership.
The "SMED TPM" mixes TPM tools and SMED tools to obtain a set up optimization and a productivity increase sustainable in the time

STEP	ACTION	WHO
Step 1		
Step 2		
Step 3		
Step 4		
Step 5		
Step 6		
Step 7		
Step 8		

BENEFITS

- ✓Increase of worker knowledge
- ✓Worker commitment and involvement since from definition phase increase of sense of ownership
- ✓Worker point of view in the changing of process and lines
- ✓A bottom up and top down strategy
- ✓Introduction and optimization of TPM activities in set up activities
- ✓Less resistance to the change

Lean Safety

Lean Safety is a methodology and a set of tools comes from Lean management. It applies Lean Management principles and tools (modified) in safety process, involving directly workers, empowering them in safety issues. Through Lean Safety application, safety becomes a part of operation process and daily activities.

Parallelism Lean Management and Lean Safety

LEAN MANAGEMENT	LEAN SAFETY

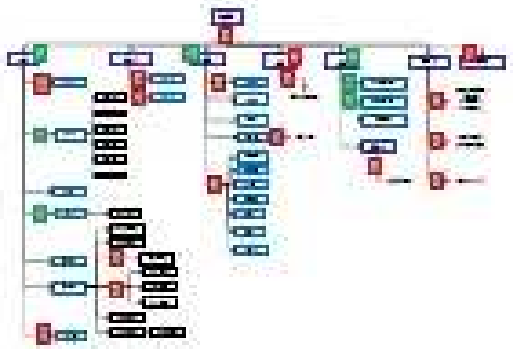
Tools and possible parallel application

- SSM — Safety Stream Mapping
- RMEA — Risk Mode Effect Analysis
- 5S — Problem Solving — Poka Yoke — 5 perche — Kaizen Group — Gestione a Vista — Ergonomia
- TRAINING
- MIGLIORAMENTO CONTINUO
- VSM — Value Stream Mapping
- FMEA — Failure Mode Effect Analysis
- 5S — Problem Solving — Poka Yoke — 5 perche — Kaizen Group — Gestione a Vista — TPM — Manutenzione Autonoma

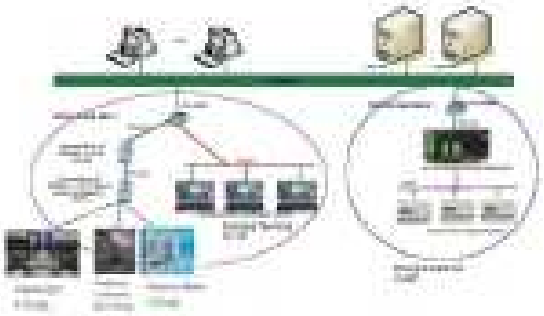
BENEFITS

- ✓Opportunities from lean management and lean safety synergies
- ✓Creation a safety culture within workers and operation managers
- ✓Change mentality from reactive to proactive

- Control System for Plant Energy Consumption

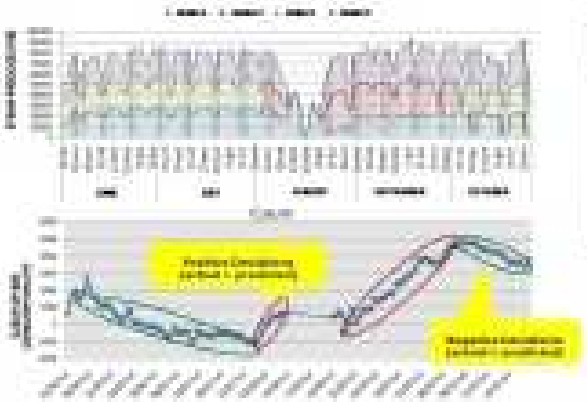


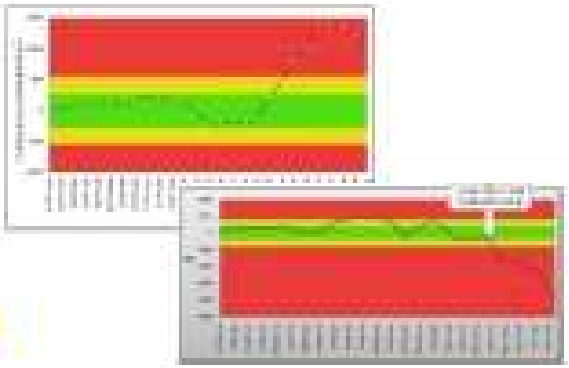
MEASUREMENT SYSTEM DESIGN



DATA MONITORING SYSTEM

FORECASTING MODEL DEVELOPMENT

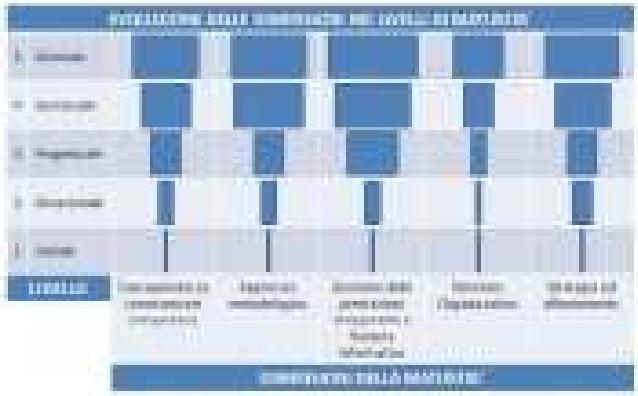




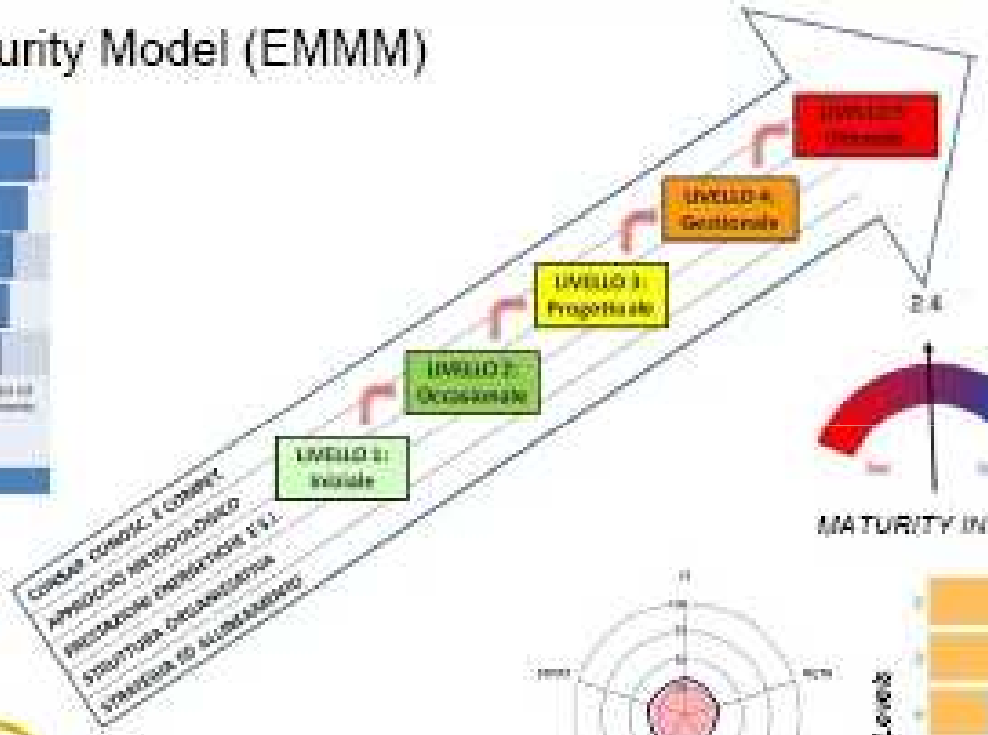
ENERGY CONSUMPTION CONTROL – CORRECTIVE ACTION IMPLEMENTATION

ENERGY BUDGETING AND CONTROL

- Energy Management Maturity Model (EMMM)



MATURITY MODEL



MATURITY INDEX

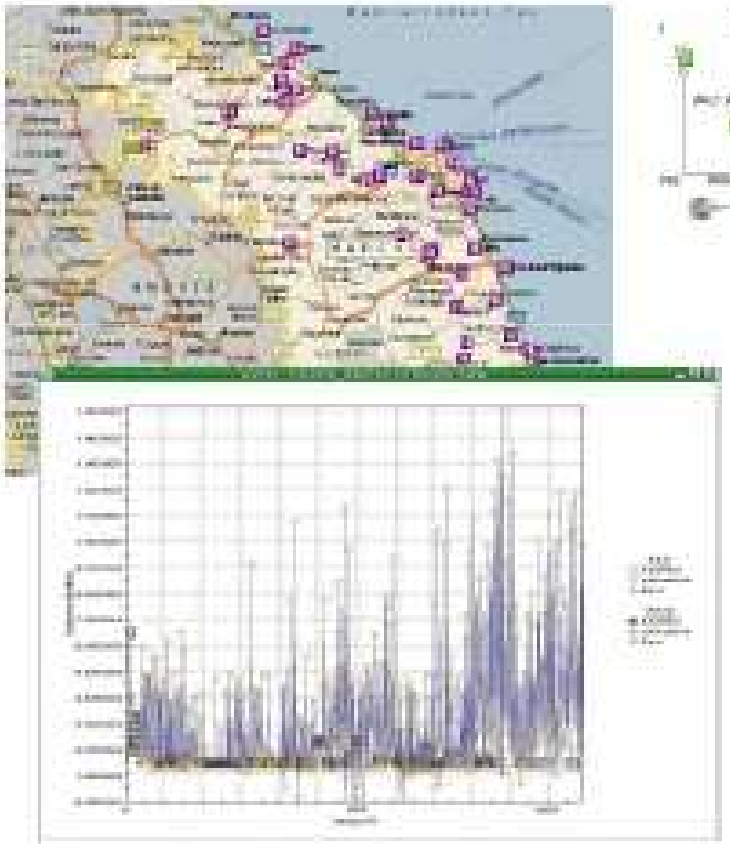
ONLINE QUESTIONNAIRE

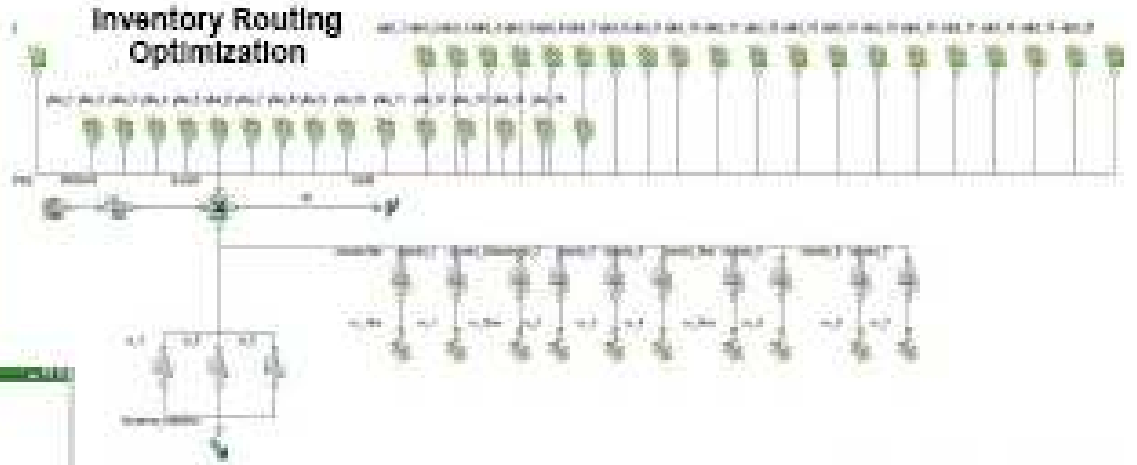
Only 40 questions!

SELF-ASSESSMENT RESULTS

Assess your maturity in energy management on www.emmm.uniroma2.it !

- L.U.C.U.L.LO: designing a Made-in-Italy wine and food supply chain





Dynamic and Stochastic Network Design

$$V_t\left(D, w_i^{(t)}, o_i^{(t)}, c_i^{(t)}, t\right) = \min \sum_{i \in I} O_i^{(t)} o_i^{(t)} + \sum_{i \in I} C_i^{(t)} c_i^{(t)} +$$

$$+ \sum_{x^{(t)} \subseteq (I - z^{(t-1)})} P(N^{(t)}) \left(G\left(D^{(t)}, w_i^{(t)}, z_i^{(t)}, t\right) + V_{t+1}\left(D, w_i^{(t)}, o_i^{(t)}, c_i^{(t)}, t\right) \right)$$

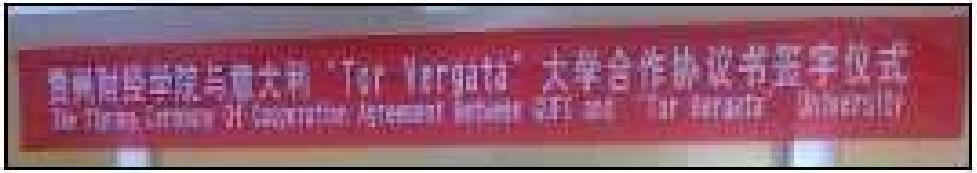
In collaboration with the Operations Management Research Group of Carnegie Mellon University (Pittsburgh, PA, USA)

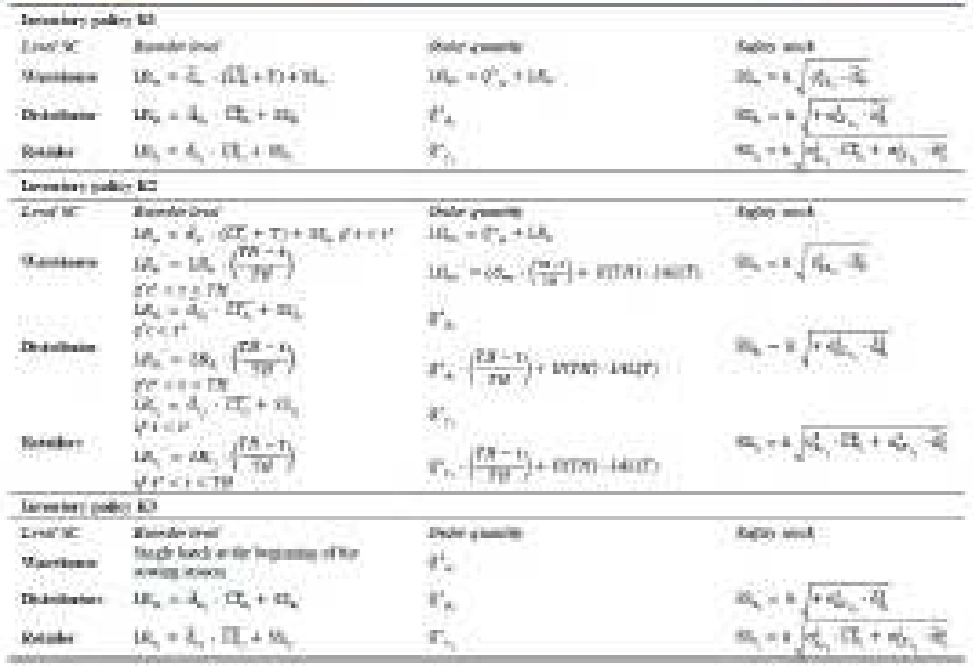
Paolucci, Pumarola, Sciretti, "Sustainable Transportation Systems: dynamic routing optimization for Conference on "Sustainable Development: the role of industrial engineering", Monopoli, Bari (Italy), 15-19/09/2009

- Rice Value Chain Optimization in China

Economic assessment	
14%	Post-harvest losses assumption
378 $/t	Retailers milled rice price assumption
4.611.000 t	Chinese rice output (2008)
645.540 t	Estimated rice loss
244.014.120 $	Estimated revenues loss

Phase	Potential losses
Harvesting	Lodging
	Shattering
	Delayed harvest
	Pressing
Field stacking	Yellowing
	Discoloration
Threshing	Spillage
	Mechanical damage
Field drying	Retrieval loss
	Sun checking
	Discoloration
Wet grain	Discoloration
	Germination
Plant drying	Over-drying
	Non-uniform drying
	Pressing
Storage	Pest infestation
	Moisture migration
	Discoloration
	Rotting
Milling	Over-milling
	Mechanical damage
Milled rice storage distribution	Short shelf life
	Insect pest damage





Bottani, Rizzoli, Montanari (2008) «Inventory Control Policies for Humanitarian Logistics Supply Chain» Conference on "Sustainable Development: the role of industrial engineering", Monopoli, Bari (Italy), 15-19/09/2008

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Top 10 Publications

Authors	Title	Journal/Conference	Year	AREA
Cesarotti, Dell Orazi, Introna	Improve Energy Efficiency in Manufacturing Plants through Consumption Forecasting and Real Time Control: Case Study from Pharmaceutical Sector	International Conference on Advances in Production Management Systems	2010	6
Biagiotti, Cesarotti, Giuliusa, Spada	Moving Forward the Limits for Service Operations Optimization	International Conference on Service Sciences - Hangzhou, Zhejiang China;	2010	6
Cesarotti, Di Silvio, Introna	Improvement of maintenance practices through the introduction of energy consumption control system	International Conference on the Modern Information Technology in the Innovation process of the Industrial Enterprises (MITIP)	2009	6
Cesarotti, Di Silvio, Introna	Energy budgeting and control: a new approach for an industrial plant	International Journal of Energy Sector Management (Emerald)	2009	6
Cesarotti, Di Silvio, Introna	Evaluation and optimisation of manufacturing system using simulation modeling and design of experiment	20th European Modeling and Simulation Symposium	2008	1
Cesarotti, Di Silvio, Introna	Optimizing control parameters of industrial processes with attribute response through Design Of Experiments: a case study of an injection molding process	International Conference on the Modern Information Technology in the Innovation process of the Industrial Enterprises (MITIP)	2008	3
Armenia, Falsini, Schiraldi	Improving management effectiveness and overall performance of multi-project organizations	XXII IPMA World Congress on Project Management	2008	6
Cesarotti, Di Silvio, Introna	Evaluation of electricity rates through characterization and forecasting of energy consumption: A case study of an Italian industrial eligible customer	International Journal of Energy Sector management (Emerald)	2007	6
Nenni, Schiraldi, Van de Velde	Determining safety stock with backlogging and delivery spare time	XVIII International Conference on Production Research (ICPR)	2005	1
Cavalieri, Cesarotti, Introna	A multiagent model for coordinated distribution chain planning	Journal of Organizational Computing and Electronic Commerce	2003	8

Research Topics – Ing/Ind-17

1	2	3	4	5	6	7
Production system analysis and design	Auxiliary plant analysis and design	Processes and production technologies	Ergonomics and safety of industrial systems	Production system management	Logistics	Production system automation

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Research Projects in the last 3 years

Year	Company/Funding	Project theme / name	Active	Completed	AREA
2011	SOGEI	Assessment of the efficiency of the thermal plant in Rome Hq.	X		2
2011	Logical System	Various projects on IT and operations management	X		1
2011	Selex SI	Analysis of the working capital in C-class materials stock	X		6
2010	Ansaldo Breda	Definition of the maintenance policies for a urban train	X		6
2010	Finmeccanica GS	Definition of a guidelin for PLM for Finmeccanica Group	X		6
2010	Abbott	Support to Lean Projects		X	3
2010	University funding	Value chain optimization for rice production in China	X		6
2009	Camomilla Italia	Analysis of the efficiency of logistics processes		X	6
2009	Enel/STM/Sharp (Altran)	Quantity surveying in the design of a new photovoltaic fab in Catania		X	1
2009	SOGEI	Support in the design of the electrical system in Rome Hq.		X	2
2009	CIPI	Support to the design of a new warehouse system		X	6
2009	BCR	Analysis of the material handling procedures efficiency		X	6
2009	MSE Industria2015	New distribution criteria for enogastronomic products	X		6
2009	MSE Industria2015	City logistics approaches for goods distribution	X		6
2008	Stryker	Support to the evaluation of investments in ASRS systems		X	6
2008	Enginfo	Permanent cohoperation of IT and operations management themes	X		6
2008	Assosistema	Performance Measurement and Control System for Laundry Sector	X		1
2008	Pfizer	Introduction of a Reliability Centered Maintenance System		X	5
2008	eFM	Third party inspection bodies for external quality assurance	X		5
2008	Sanofi Aventis	Support to Total Productive Maintenance project	X		5
2008	Indesit Company	Plant Energy Consumption: Analysis and Reduction		X	1
2008	Inspiring Software	Software for Plant Energy Consumption Monitoring and Control		X	5
2008	POR3.17 Campania	Design of a manufacturing systems simulation tool		X	1

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Research Partners & Collaborations

Industrial Companies

- Abbott Italia (Aprilia)
- ACM-e (Milano)
- Altran Italia (Roma)
- AKKA Technologies (Roma)
- Ansaldo Breda (Napoli)
- Arthur D. Little (Roma)
- BCR (Catania)
- Best (Cerreto d'Esi)
- Camomilla Italia (Napoli)
- Cipi (Catania)
- Cons. Technova (Napoli)
- Cons. Roma Ricerche (Roma)
- DEVO Team (Roma)
- eFM (Roma)
- Elica (Fabriano)
- Ellos (Camerino)
- Enea (Roma)
- EngInfo (Napoli)
- ESE Engineering (Roma)
- Finmeccanica (Roma)
- FIT Consulting (Roma)
- Geocom (Jesi)
- Green Energy Plus (Roma)
- Grafibox (Roma)
- Haupt Pharma (Latina)
- ICM Consulting (Genova)
- Indesit (Fabriano)
- Infoservice (Napoli)
- Inspiring Software (Milano)
- Innova (Roma)
- Logical System (Jesi)
- Oltre (Roma)
- Parallaksis (Napoli)
- Philips - Lighting Division (Eindhoven, NL)
- Rolls-Royce Motor Cars (Goodwood, UK)
- Sanofi Aventis (Anagni)
- SAS Institute (Roma)
- Selex SI (Roma)
- Sogei (Roma)
- Solving Efeso (Milano)
- Soluta (Treviso)
- Stryker (Roma)
- T-Systems MMS (Dresda, D)
- TNT Express ICS (Atherstone, UK)
- Value Partners (Roma)
- Vortika (Bologna)

Others

- Associazione Nazionale Imprese di Trasporto Automobilistico – ANITA, Roma
- Confederazione Nazionale Artigianato CNA Emilia Romagna (Bologna)
- Associazione Sistema Industriale Integrato Servizi Tessili e Medici Affini – Assosistema, Roma
- CATTID RFID-Lab (Roma)
- European Foundation for Quality Management EFQM (Bruxelles)
- Federazione Imprese di Servizi – FISE (Roma)
- Federazione Italiana Responsabili e Addetti alla Sicurezza Servizi di Protezione e Prevenzione FIRAS-SPP (Roma)
- Federazione Italiana Trasportatori – FEDIT (Roma)
- Food and Agriculture Organization – FAO (Roma)
- Istituto Italiano di Project Management – ISIPM, (Roma)

Foreign Universities

- Carnegie Mellon University (Pittsburg, USA)
- Erasmus Universiteit (Rotterdam, The Netherlands)
- Guizhou University of Finance and Economics (Guiyang, P.R. China)
- INSEAD Business School (Fountainbleu, France)
- University of Arkansas (Fayetteville, USA)
- University of Kaiserslautern (Germany)
- UPC Universidad Politecnica de Catalunya (Spain)
- Georgetown University (Washington D.C., USA)
- University of Wuppertal (Germany)