BUS & WORKSHOP
in public transport company
the case of Trieste Trasporti S.p.A.

Roberto GERIN, Fabio VIDOTTO
Where Trieste Trasporti operates?

- Employees: 830
- Urban Bus: 270 (6 Tram)
- School Bus: 8
- Coach: 8
- Production: 13 Mil KM/Year
- Bus Stop: 1,400
- Area: 212 Km2
- Inhabitants: 230,000
- Customers: 80 Mil Trips/Y (estimated)
How Trieste Trasporti operates?

- URBAN AREA, WITH HIGH CONGESTION, LOW COMMERCIAL SPEED
- LONG TIME FOR BOARDING & ALIGHTING
- CONTINUOUS OF STOP & GO
- ROUTES WITH VERY HIGH SLOPE
- HARD OPERATION FOR BRAKES, GEARS, ENGINES
KEY FACTORS IN BUS MGMT

MAN

PROFESSIONALITY & PEOPLE ORGANISATION

METHOD

PREVENTIVE MAINTENANCE - MAINTENANCE PLAN - Q CERTIFICATION

MACHINE

NEW BUS - STRONG COOPERATION WITH MANUFACTURER

WORKSHOP MANAGEMENT TRIESTE TRASPORTI - ©2003
Maintenance software as INTEGRATOR

MAN

METHOD

software

MAXIMO MRO

MACHINE

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THE TRIESTE TRASPORTI
BUS FLEET
**MEAN BUS FLEET AGE**

**BY OPERATION CONTRACT**
**IN 2001:**
**NEW 33 BUS/YEAR**

**ACTUAL FLEET COMPOSITION**

- **< 3 years:** 50%
- **from 4 to 6 years:** 25%
- **from 7 to 9 years:** 8%
- **from 10 to 12 years:** 5%
- **from 13 to 15 years:** 12%
- **> 15 years:** 0%

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**MEAN BUS FLEET AGE**

<table>
<thead>
<tr>
<th>Year</th>
<th>Mean Bus Age (year)</th>
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<tbody>
<tr>
<td>dic-99</td>
<td>10.5</td>
</tr>
<tr>
<td>giu-00</td>
<td>10.4</td>
</tr>
<tr>
<td>dic-00</td>
<td>10.8</td>
</tr>
<tr>
<td>giu-01</td>
<td>8.8</td>
</tr>
<tr>
<td>dic-01</td>
<td>7.3</td>
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<tr>
<td>giu-02</td>
<td>7.4</td>
</tr>
<tr>
<td>dic-02</td>
<td>5.6</td>
</tr>
<tr>
<td>giu-03</td>
<td>4.8</td>
</tr>
</tbody>
</table>

**Today**
ACTUAL FLEET MANUFACTURERS

- BredaMenariniBus: 46.7%
- Irisbus / Iveco: 49.3%
- Scania: 0.4%
- DeSimon / Van Hool: 1.9%
- Autodromo: 1.9%
FLEET EMISSION IMPROVEMENT

% fleet

- EURO 0
- EURO 1
- EURO 2
- EURO 3

ACTUAL FLEET LENGTH

- NORMAL (10,5 m): 52,6%
- LONG (12 m): 28,9%
- MEDIUM (9 m): 7,8%
- SHORT (7,5 m): 5,2%
- ARTICULATED (18 m): 5,6%
COMFORT & FACILITIES

- Low floor & kneeling
- Ramp for disabled
- Voice & visual next stop announce
- Useful information
- Radio connection for security
- AVM system and alarm button
- Air conditioning
- Cameras for door control
- Sensor “anti crush” for all doors
- Multiplex
- Passengers counter
WORKSHOP MANAGEMENT
in
TRIESTE TRASPORTI
WORKSHOP MANAGEMENT

GOAL

FUNCTION

AVAILABILITY

RELIABILITY

SECURITY

EFFICIENCY

WORKSHOP MANAGEMENT

SCHEDULED WORKORDER

UNSCHEDULED WORKORDER

SERVICING

REFUELLING

CLEANING

INSPECTIONS

FAULT REPAIR (ON SERVICE)

FAULT REPAIR (OUT OF SERVICE)

ON CONDITION

( FROM INSPECTION)

ENGINE OR BODY OVERHAUL

TECHNICAL IMPROVEMENT

PREVENTIVE MAINTENANCE

EMERGENCY

TRAFFIC CRASH

KM DEADLINE

LEGAL (ANNUAL) DEADLINE
METHOD & ORGANISATION

- From FAULT MAINTENANCE (UNSCHEDULED) toward PREVENTIVE MAINTENANCE (PLANNED)
- MAINTENANCE PLAN FOR EVERY BUS TYPE
- EXTERNAL SERVICING & PARKING
- NEW MAINTENANCE INFORMATION SYSTEM for:
  - INTEGRATE
  - SHARE METHOD & DATA
  - KNOW, MANAGE & CONTROL

MAXIMO
## IMPROVEMENT ACTION

<table>
<thead>
<tr>
<th>Anno</th>
<th>RAC n°</th>
<th>RAP n°</th>
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<tbody>
<tr>
<td>2002</td>
<td></td>
<td>03</td>
</tr>
</tbody>
</table>

### Problema generato da

- **V.I. n°** Data
- **Area** Cap
- **Indicatore di processo** Codice X-MA-200
- **N° Domanda** Mese Giugno
- **Sorveglianza**

### Descrizione Non Conformità

Sblocco difficilissimo del freno di stazionamento sui bus 231/E3 e 240/E3 della Breda Mesarini Bus, a fronte dell'attivazione automatica del sistema di sicurezza.

<table>
<thead>
<tr>
<th>Data</th>
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<tbody>
<tr>
<td>12/06/02</td>
<td></td>
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### AC / AP proposta

Introduzione di un dispositivo di sblocco: elettrovalvola e interruttore di sicurezza (vedi allegato).

<table>
<thead>
<tr>
<th>Data attuazione prevista:</th>
<th>Responsabile/i:</th>
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<tbody>
<tr>
<td>12/06/02</td>
<td>Vidotto, Palci, Trombetta</td>
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</tbody>
</table>

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**Workshop Management Trieste Trasport:**

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**del freno di stazionamento in modello 231/E3 e 240/E3 della Mesarini BUS**

**Fabio Vidotto**

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**Figura:**

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**ISCO 2001**

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**Richiesta AC/AP**

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**Riduzione Funzione Qualità**

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**TUV**

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**Mesarini Bus**
- **BUS AND COMPONENTS ARE “ITEMS”**
  - ENGINE
  - TYRES
  - GEAR
  - GENERATOR
  - TICKETING MACHINES

- **THEY MOVE FROM A DEPOT OR FROM A BUS TO ANOTHER**

- **THE INFORMATION SYSTEM TRACE**
  - DISTANCE
  - FAULT
  - SPARE PARTS
  - LABOUR HOURS
  - OPERATION
Maintenance is fully integrated across the company and with other system
### Maintenance vs. Operation

#### Workshop Management

**TRIESTE TRASPORTI S.P.A.**

<table>
<thead>
<tr>
<th>Azienda</th>
<th>001</th>
<th>TRIESTE TRASPORTI S.P.A.</th>
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<tbody>
<tr>
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<td>Tipo veicolo</td>
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<tr>
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</table>

**Informazioni Genera OdL**

- **Data Inizio:** 14/09/1982
- **Conteiner:** 03/05/2002
- **Data del giornata:** 06/02/2002
- **Prevista:** N
- **Usa la Frequenza per la Schedulazione:** Y

**MP Basate su Contatore**

<table>
<thead>
<tr>
<th>Contatore 1</th>
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<tbody>
<tr>
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<tr>
<td>Prossima Data Pre vista</td>
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**Stagione Validità**

- **Mese:**
  - **Inizio:**
  - **Fine:**
- **Giorno:**
  - **Inizio:**
  - **Fine:**
### Maintenance vs. Operation

#### View on Maintenance

![Maintenance View](image1.png)

#### View on Operation

![Operation View](image2.png)

#### Bus Assignment

![Bus Assignment](image3.png)

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**Workshop Management Trieste Trasporti - ©2003**
Maintenance vs. Quality

Sostituzioni aprile

Interventi in linea aprile
Workshop organisation achievements

- **ORGANISATION**
  - 20% less on personnel costs
  - increase professional operators
- **BUS RENEALUAL**
  - from 11 average bus age (2000) to 4,8 (actual)
- **INFORMATION**
  - ALL maintenance activities are managed by MAXIMO
  - Figures and trends cause improvement actions
  - ALL operators share the same information
Workshop organisation achievements

- **AVAILABILITY**
  - 2000: 85% (with minimum at 78%)
  - 2002: 90% (with 94% peaks)

- **LOSS PRODUCTION**
  - zero bus unavailability from september 2001
  - loss journeys (by fault) from 0.56% (1988) to 0.03% (2001)

- **RELIABILITY**
  - important reduction on bus drawings, fluid loss and disservices

- **EFFICIENCY**
  - maintenance cost from 0.57 €/km to 0.43 €/KM
  - of which direct costs (labour & spare) 0.28 €/KM
Maintenance: the VISION

ON BOARD CONTROL SYSTEM (MULTIPLEX)

ON BOARD DATA COMMUNICATION

PUBLIC OR PMR DATA COMMUNICATION

Toward TELE maintenance?

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Conclusions

• Efficient maintenance is a key factor in the competitive (Italian) tpl scenario

• Efficiency MUST joins with availability, reliability and security

• In TPL Company maintenance is a CORE COMPETENCE, to be retained and increased

• Costs will decrease if organisation and professionality will increase

• Co-operation with bus manufactures is another key factor: also new busses have failures!