



Celebrating
50 YEARS
OF Successful
TOLL ROAD PROJECTS

THE ARGO PROJECT

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Autostrade per l'Italia

Hosted by

ICA

YAVUZ SULTAN SELIM BRIDGE
AND
NORTHERN RING MOTORWAY



Autostrade per l'Italia Company Asset

Autostrade per l'Italia Group The largest highway operator in Europe



~ 3.000 km
motorway
network



~ 320 km
tunnels



~ 4400
bridges
/viaducts and
overpasses



4,6 M
daily
customers



2,7 M
daily vehicle
transit



autostrade // per l'italia



Technology,
R&D



Engineering and
implementation



Construction and
related services



Energy from
renewable sources



Services for
travellers

- around **3.000 km** of highway managed
- **4,6 million** customers travel along the network every day



~ 2600 bridges/viaducts



~ 1800 overpasses



~ 600 tunnels (~ 320km)

**Asset
Management
strategy**

- Database for **full knowledge** of the assets
- Improving **preventive maintenance**
- **Maximise** the effects of interventions

THE NEW INTEGRATED SYSTEM FOR ASSET MANAGEMENT

ARGO - Bridge Management System (BMS)



Consolidate

data and expertise created through decades of motorway's asset management



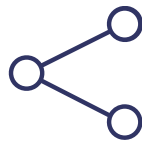
Innovate

instruments introducing state-of-the-art technologies and tools



Increase

capabilities of key-figures operating in an increasingly demanding environment

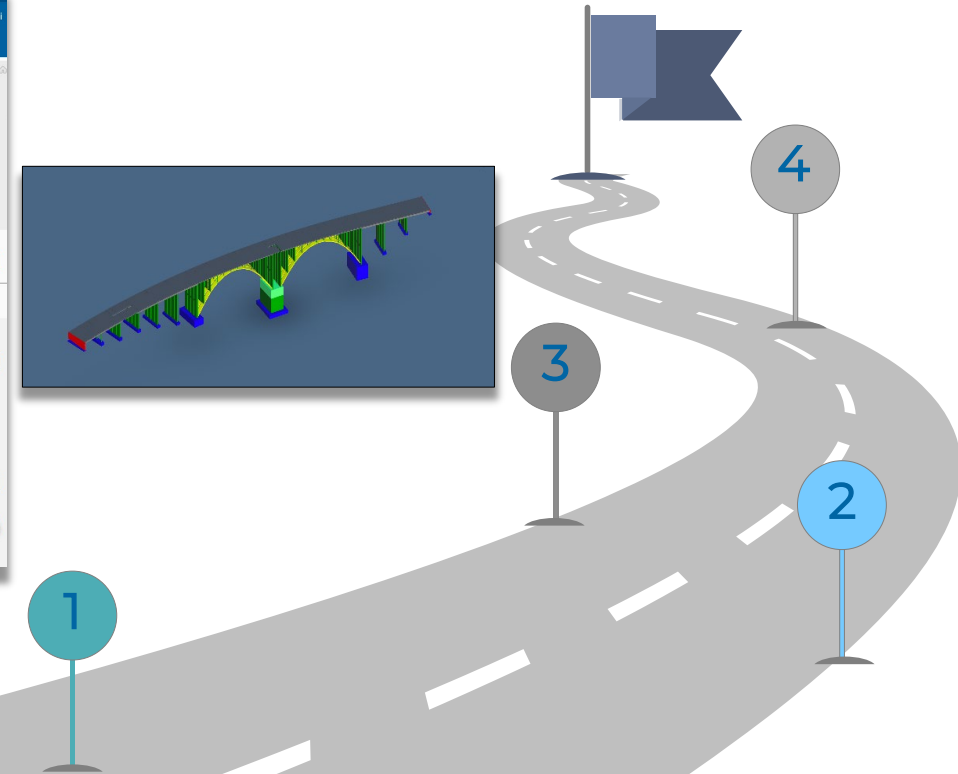
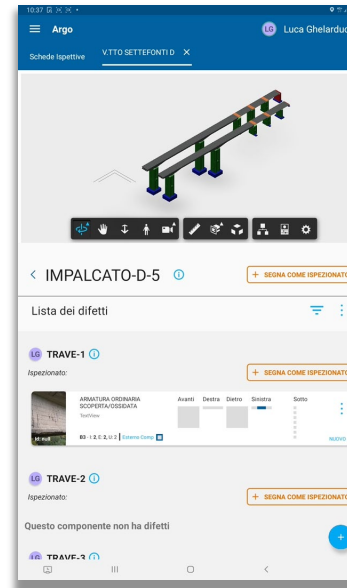


Share

and guarantee traceability of information with stakeholders in transparency



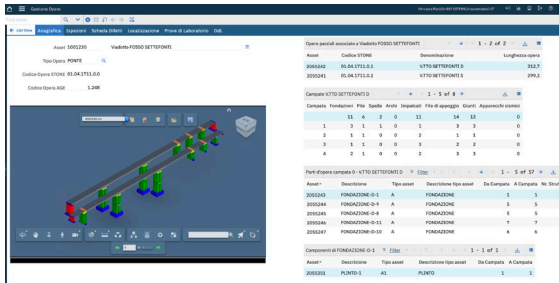
An **innovative**, **integrated** and **certified** system developed by **MOVYON** and based on IBM Maximo that integrate inspection, structural monitoring and maintenance processes



ARGO – BRIDGE MANAGEMENT SYSTEM (BMS)

Main features

Digital Asset Registry



Fully management of the **information** related of the infrastructure assets (bridges, viaducts)

Inspection Process



Digitization of the inspection process through the use of a custom mobile app

Monitoring and IoT



Automatic detection of data from **sensors** based on the **IoT paradigm**

Digital Twin



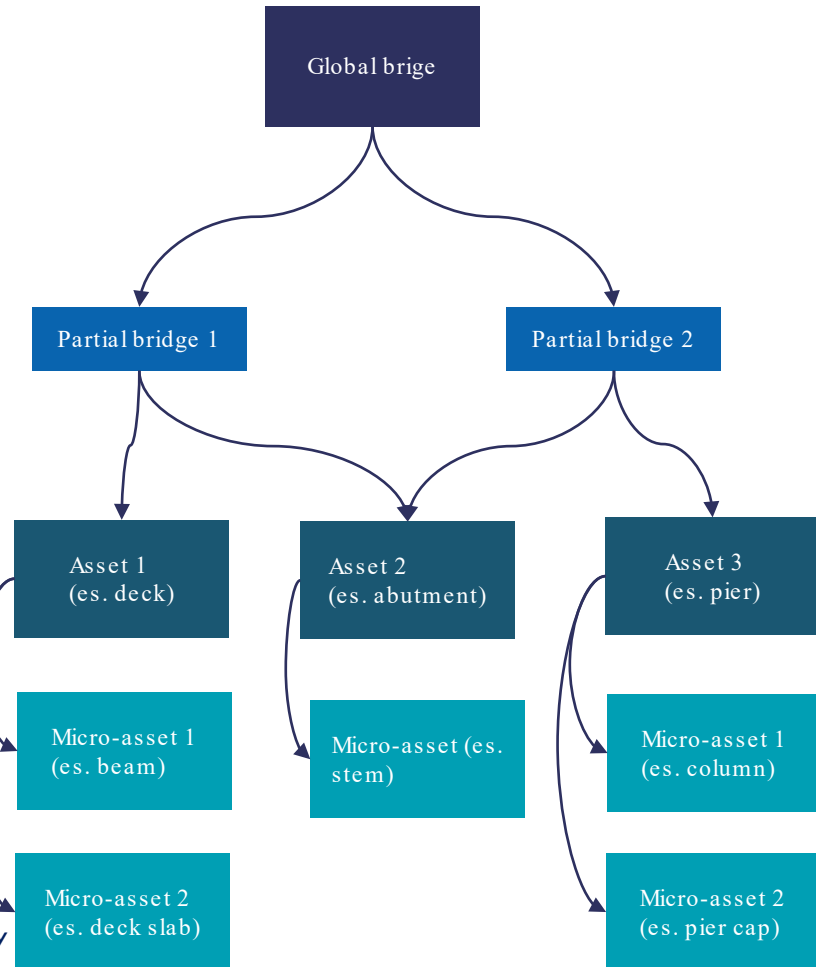
Use of Lidar, drones and photogrammetry to obtain a **digital twin** of the asset

ARGO – BRIDGE MANAGEMENT SYSTEM (BMS)

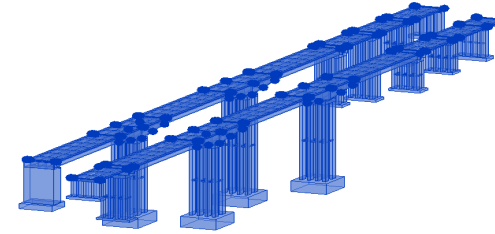
Digital Asset Registry



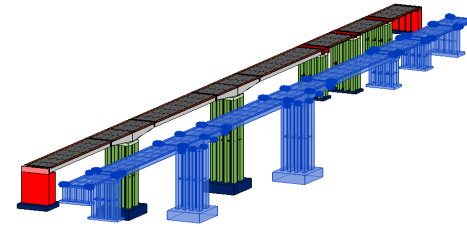
Every bridge/viaduct is discretized in detail to have the information related to the specific element.



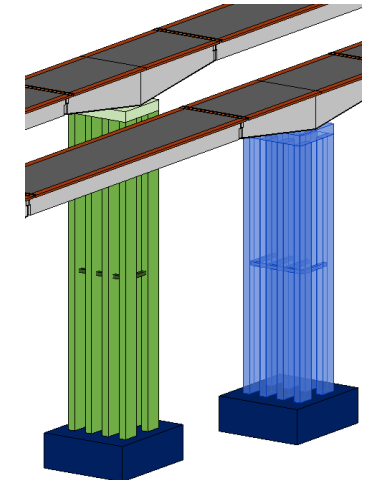
1st level



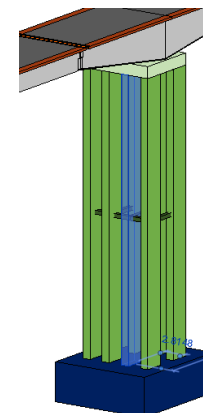
2nd level



3rd level



4th level

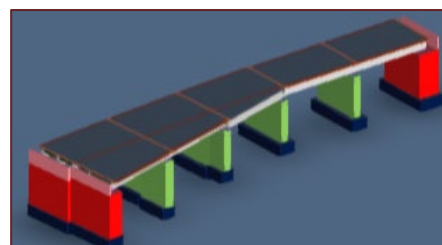
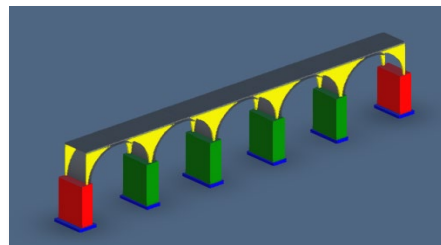
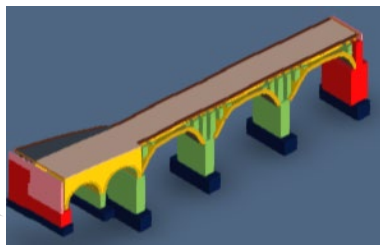
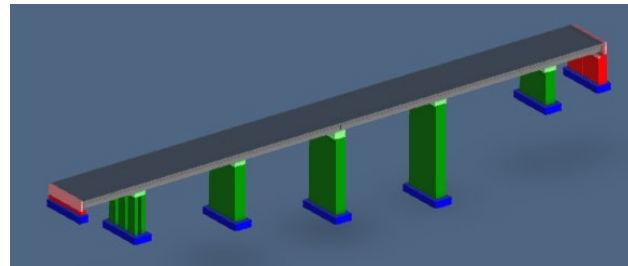
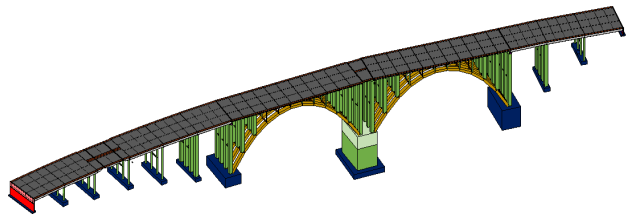


ARGO – BRIDGE MANAGEMENT SYSTEM (BMS)

Digital Asset Registry – Automatic BIM Model



Examples of Automatic BIM Models



INPUT



ALGORITHM



OUTPUT

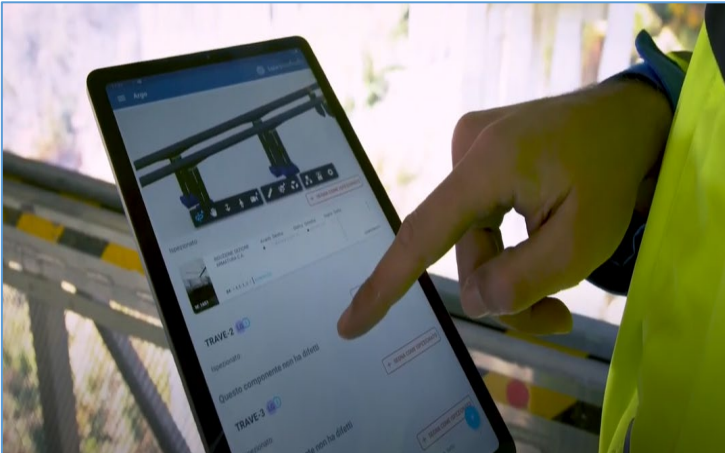
- ASSET DISCRETIZATION (4 Levels)
- ELEMENT POSITIONS (x, y, z)
- SPAN
- ELEMENT PROGRESSIVE NUMBER
- RELATIONSHIPS BETWEEN ELEMENTS (Adjacent or Overlying)
- ATTRIBUTES (dimensions, morphology, etc.)



ARGO – BRIDGE MANAGEMENT SYSTEM (BMS)

Inspection Process

- **Mobile App** that assists the inspector and makes the inspection phase more effective and efficient
- **BIM Model on Mobile App** fully navigable and searchable in situ;
- **Detailed defects on each micro-asset (4th level)** of the works (ie on the single beam, transverse, elevation, etc.)
- **Picture** for each defect at each inspection cycle with immediate comparison with the past;



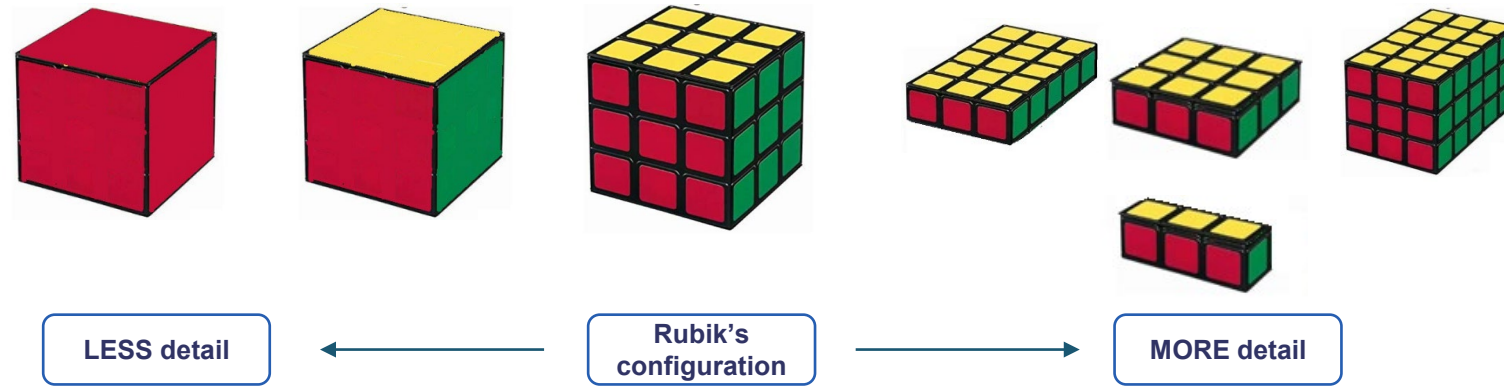
ARGO – BRIDGE MANAGEMENT SYSTEM (BMS)

Inspection Process

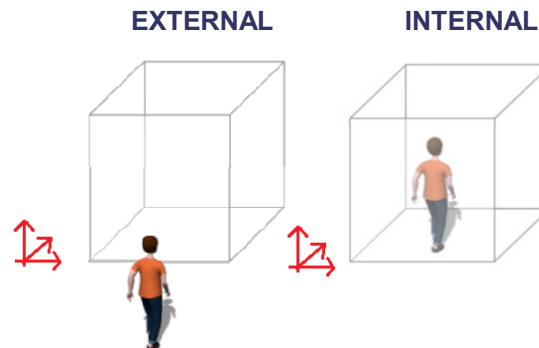


The innovative idea was to consider each asset to be inspected as a 6-sided element like a Rubik's cube where the inspectors can indicate the defects and their extension.

Each of the faces has been divided into many areas according to the size of the asset to be considered. **This has determined different configurations where to insert the defects**



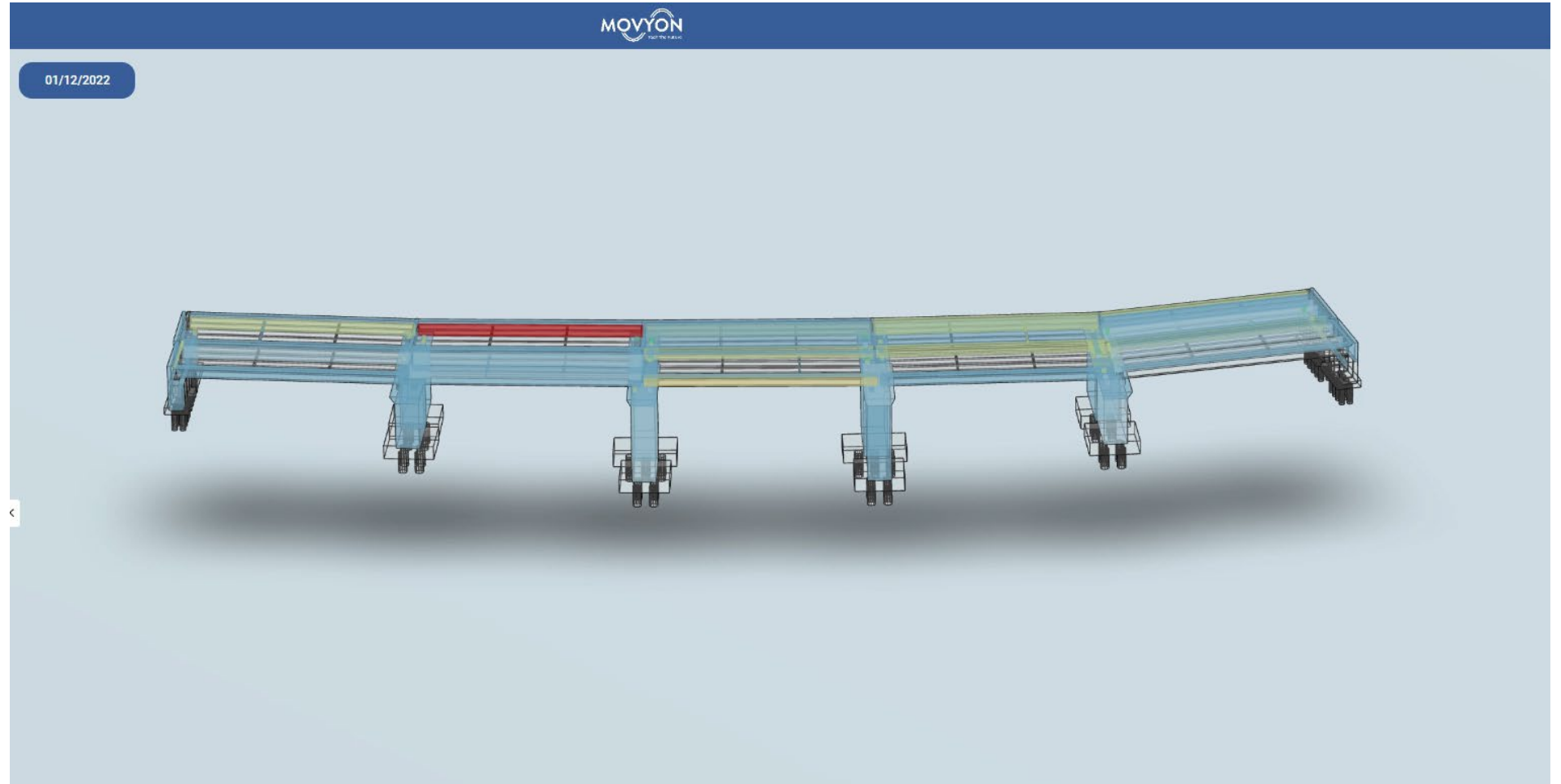
All assets are inspected externally. Hollow assets are also inspected from the inside with the same 6-sided split:



ARGO – BRIDGE MANAGEMENT SYSTEM (BMS)

Inspection Process

Easy review of the results of the inspections with the viewer in which the **BIM model** is **colored** according to the defects present on the components.

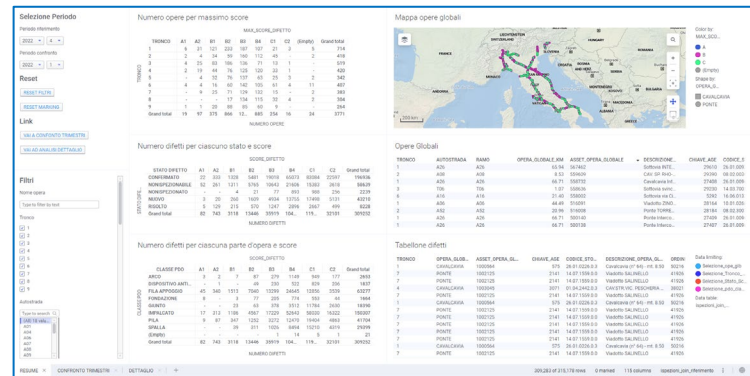
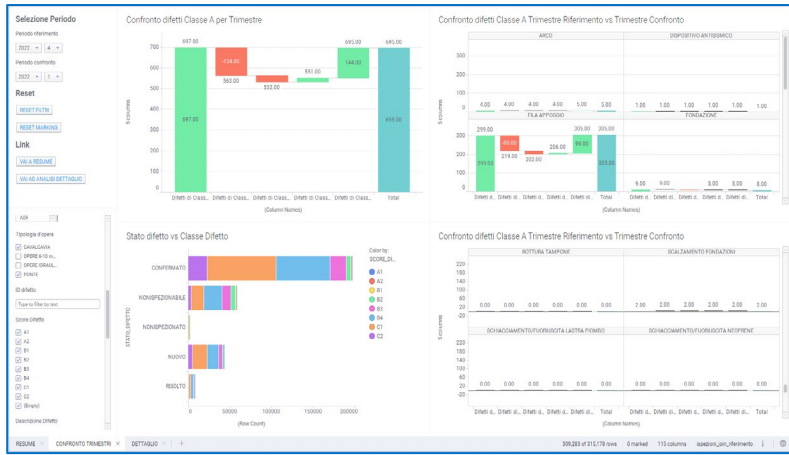


ARGO - BRIDGE MANAGEMENT SYSTEM (BMS)

Inspection Process



The **asset data** and **inspections data** can be combined and analyzed to perform all types of reports, graphs and tables useful for **monitoring the network status** and **plan the maintenance with a data driven approach**.



File Edit Data Visualizations View Tools Help User
Viewing

Trimestre Riferimento
Trimestre Confronto

2022
4
2022
3

Filtri

Nome opera

Tronco

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9

Autostrada

Ramo

Tipologia d'opera

- CAVALCAVIA
- OPERE 6-10 m
- OPERE IDRAUL.
- PONTE

Numero opere per massimo score

TRONCO	A1	A2	B1	B2	B3	B4	C1	C2	(Empty)	Grand total
1	6	30	109	164	131	64	7	1	5	517
2	4	22	30	52	41	20	-	-	1	172
3	2	21	49	67	35	23	4	-	-	201
4	2	19	44	53	52	60	18	1	-	249
5	-	4	21	39	53	37	10	1	-	165
6	4	4	8	21	55	61	39	3	6	201
7	-	9	23	55	62	41	5	-	2	197
8	-	-	-	6	21	25	23	1	-	76
9	1	1	14	61	62	52	6	-	-	197

Numero difetti per ciascuno stato e score

STATO_DIFETTO	A1	A2	B1	B2	B3	B4	C1	C2	Grand total
CONFERMATO	22	330	1237	4794	15425	52592	64283	15059	153742
NONISPEZIONABILE	52	261	1215	5351	9379	19944	14962	3323	54487
NONISPEZIONATO	-	-	4	21	77	893	988	256	2239
NUOVO	-	14	114	729	1467	6313	6443	1170	16250
RISOLTO	5	128	208	506	1034	2647	2517	486	7531

Numero difetti per ciascuna parte d'opera e score

CLASSE PDO	A1	A2	B1	B2	B3	B4	C1	C2	Grand total
ARCO	2	2	7	87	278	1140	939	172	2627
DISPOSITIVO ANTL.	-	1	-	48	224	508	820	204	1805
FILA APPOGGIO	45	340	1371	6100	9207	20117	11617	2879	51676
FONDAZIONE	8	-	3	76	198	719	545	42	1591
GIUNTO	-	-	23	55	366	3187	9010	1767	14408
IMPALCATO	15	304	1043	3806	13858	40076	39981	9420	108503
PILA	9	86	292	1006	2484	10403	15533	3108	32921
SPALLA	-	-	39	222	760	6218	10736	2699	20674
(Empty)	-	-	-	1	7	21	12	3	44

Mappa opere globali

Opere Globali

TRONCO	AUTOSTRADA	RAMO	OPERA_GLOBALE_KM	ASSET_OPERA_GLOBALE	DESCRIZIONE_OPERA_GLOBALE
1	A26	A26	65,94	567462	Sottovia INTERCONNESSIONE A26-A21 - Loc. Alessandria Ovest
3	T06	T06	1,07	558636	Sottovia svincolo SP569 VIA NUOVA BAZZANESE
6	A16	A16	21,40	558002	Sottovia via Circumvallazione
1	A06	A06	44,49	516091	Viadotto ZINOLA II rampa di immissione
2	AS2	AS2	20,96	516008	Ponte TORRENTE MERLATA
1	A26	A26	66,71	500140	Ponte Interconnessione A21/A26 (Ramo direzione Gravellona T)
1	A26	A26	66,71	500138	Ponte Interconnessione A21/A26 (Ramo direzione Brescia)
1	A26	A26	66,71	500137	Ponte Interconnessione A21/A26 (Ramo direzione Torino)

Tabellone difetti

CODICE_STONE	DESCRIZIONE...	ID_PARTE_OP...	CLASSE_PAR...	DESCRIZIONE...	ID_COMPONE...	CLASSE_COMPONENTE	DESCRIZIONE...	ID_DI
01.04.1705.1.1	Viadotto POG.	585421	IMPALCATO	IMPALCATO-E-2	585429	TRAVE	TRAVE-8	8865
01.04.1705.1.1	Viadotto POG.	585096	IMPALCATO	IMPALCATO-E-1	585104	TRAVE	TRAVE-8	8863
01.04.1705.1.1	Viadotto POG.	585421	IMPALCATO	IMPALCATO-E-2	585425	TRAVE	TRAVE-4	8865
01.04.1705.1.1	Viadotto POG.	585271	FILA APPOGG.	FILA APPOGG.	585277	APPARECCHIATURA APPOG.	APPARECCHI...	8862
01.04.1705.1.1	Viadotto POG.	585271	FILA APPOGG.	FILA APPOGG.	585279	APPARECCHIATURA APPOG.	APPARECCHI...	8862
01.04.1705.1.1	Viadotto POG.	585271	FILA APPOGG.	FILA APPOGG.	585274	APPARECCHIATURA APPOG.	APPARECCHI...	8862
01.04.1705.1.1	Viadotto POG.	585271	FILA APPOGG.	FILA APPOGG.	585273	APPARECCHIATURA APPOG.	APPARECCHI...	8862
01.04.1705.1.1	Viadotto POG.	585271	FILA APPOGG.	FILA APPOGG.	585276	APPARECCHIATURA APPOG.	APPARECCHI...	8862
01.04.1705.1.1	Viadotto POG.	585421	IMPALCATO	IMPALCATO-E-2	585428	TRAVE	TRAVE-7	8865
01.04.1705.1.1	Viadotto POG.	585271	FILA APPOGG.	FILA APPOGG.	585275	APPARECCHIATURA APPOG.	APPARECCHI...	8862
01.04.1705.1.1	Viadotto POG.	585096	IMPALCATO	IMPALCATO-E-1	585106	TRASVERSO	TRASVERSO-1	8862
01.04.1705.1.1	Viadotto POG.	585096	IMPALCATO	IMPALCATO-E-1	585106	TRASVERSO	TRASVERSO-1	8862

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NOBENBEN BRIDGE MANAGEMENT

10

ARGO – BRIDGE MANAGEMENT SYSTEM (BMS)

Key Numbers



4.400+ ASSETS between Bridges, Viaducts and Overpasses;



600.000+ MICRO ASSETS (4TH LEVEL) to discretize assets and automatically generate all BIM models of the ASPI network;



5.000.000+ MASTER ATTRIBUTES associated with the 600,000 assets (~ 10 attributes/micro-asset);



200+ USERS/DAY between ASPI employees and consultants



15.000+ INSPECTIONS/YEAR managed with a defined process, a dedicated mobile app and data analysis tools.

THANK YOU

For further information:

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