EPSC Working Group Digitalization

Eni Safety Virtual Training Tools

San Donato Milanese, 9th June 2020

The digital initiatives – Digital Safety

Stream	Smart Operator	Safety Awareness 4.0	Safety Process Digitalization	Advanced Safety Devices
Description	New digital technologies and latest generation devices to increase the safety of our operators	Virtual and immersive reality to enhance the training on safety and emergency scenarios and spreading the awareness of Safety Golden Rules	Use of machine learning and data mining to prevent risks, analyze incidents and support the decision making	Cooperation with MIT to develop prototypes and innovative applications for next generation wearable devices
Initiatives	▪ Enhanced Operator ▪ e-WP ▪ Smart Safety	▪ **HSE Virtual Reality Training** ▪ Safety Golden Rules Mobile Simulator	▪ Safety pre-sense ▪ Digital HSE Risk Assessment ▪ Digital HSE Audit	▪ Robotic Inspection ▪ Smart Helmet

Virtual Reality Training
Safety Awareness 4.0

Virtual Reality Training for HSE activities

Approach

Provide the Safety Competence Center with a tool to propose training sessions, focused on HSE activities, which exploit Virtual Reality systems to improve the training of workers

Main Features

Remote training

Different types of training sessions (tutorial, training, assessment) provided remotely. Recording and training evaluation

Collaborative Scenario

Several workers involved simultaneously in the interactive session

Safety simulation on complex scenarios

Allow to simulate complex scenarios and control environment conditions

Operational Scalability

Possibility to develop new scenarios based on emerging needs

Program

2017

Pilot Project approved

2018-2019

Prototype development fot the Safety Competence Center

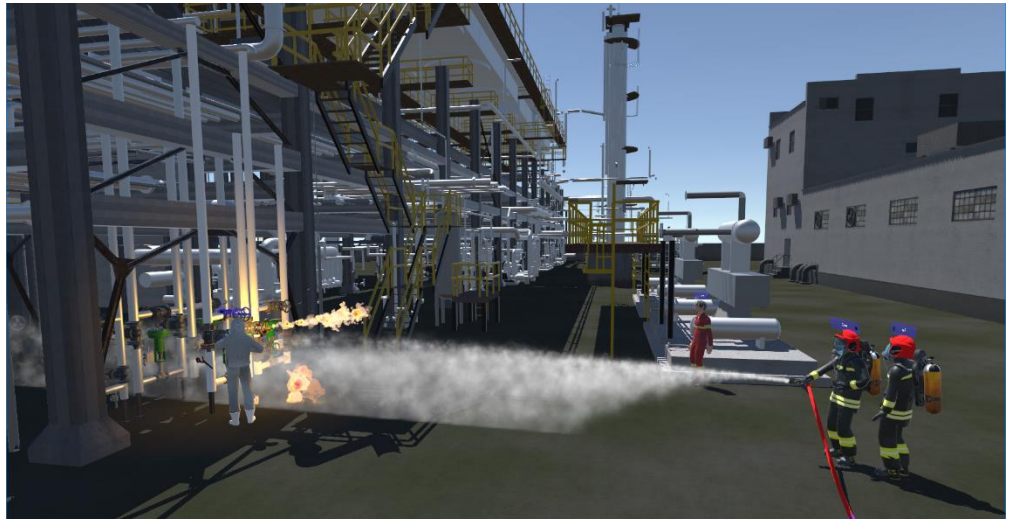
2020-23

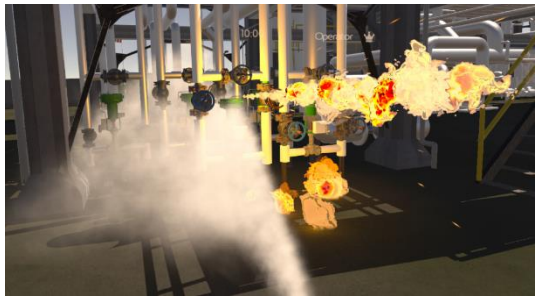
Development of different HSE scenarios and new VR Training Rooms

Virtual Reality Training

Pilot Scenario (Jet Fire)

- The simulated scenario refers to the **control of a gas jet fire** from a leaking flange, through the **interception of an upstream valve**, by the action of a **team composed by four operators**, each with a specific role.
- The scenario simulate the **right sequence of actions and behaviors** have to be adopted by operators in such situation, including the **correct use of PPE and safety devices**.
- Further actions have been defined in order to approach the **firefighting operations** properly (set-up of the hydrant, hose, nozzle, etc. and correct operational procedure and approach to the fire).



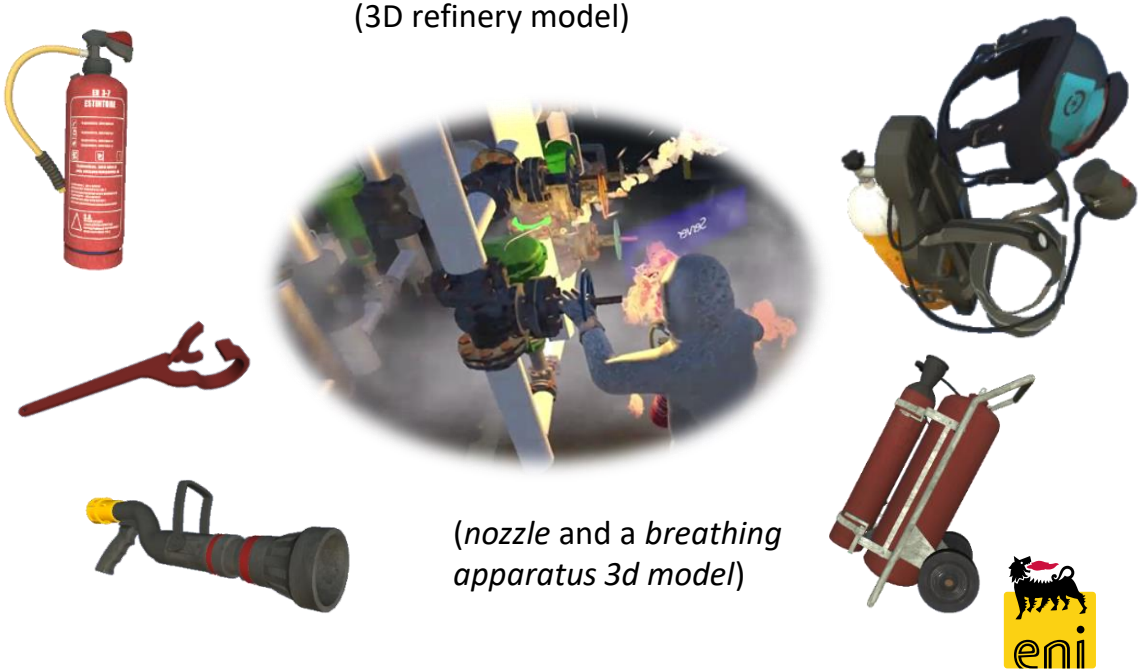


(firefighting team approaching the jet fire)

Virtual Reality Training
Virtual Environment Elements

- 3D high definition refinery model
- 3D modeling of personal protective equipment (PPE), safety devices, dynamic elements (water jet, flames, smoke) and interaction with environmental objects.
- Modeling and control during the simulation of atmospheric agents (rain, day/night, wind)
- Avatar modeling (ragdoll support, avatar visual effects e.g. blurring vision)

(3D refinery model)

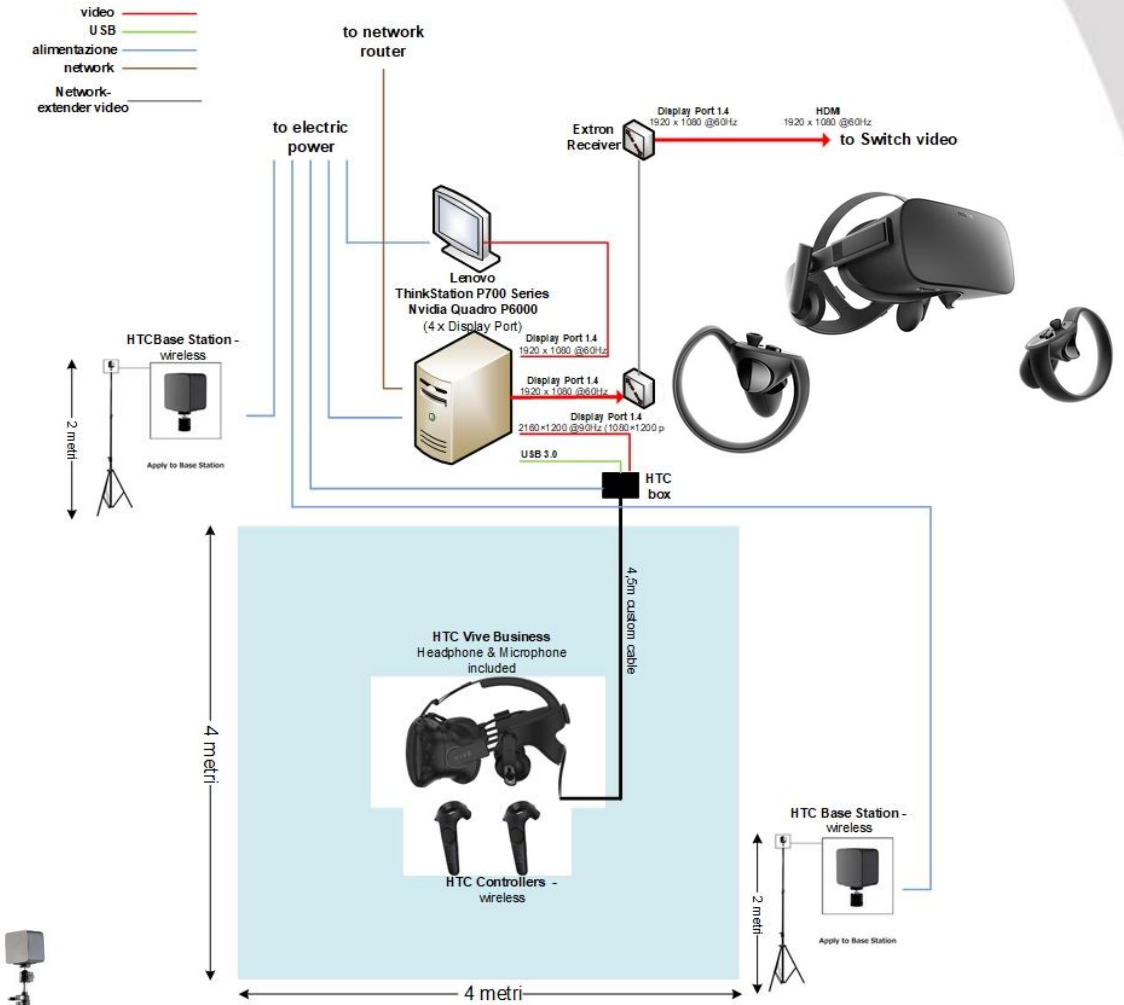


(*nozzle* and a *breathing apparatus 3d model*)

Virtual Reality Training

Pilot architetture

- The Pilot Platform is based on a Unity 3D platform developed to manage collaborative environments, that acts as accelerator for the training scenarios development.
- The system is cross-platform and the major VR devices are supported (HTC Vive, Oculus)
- The collaborative platform only communicates position differences and therefore minimizes network traffic.
- Each VR station is composed by: graphic computer; HTC Vive PRO; 2 HTC base stations for avatar tracking; 2 wireless controllers to allow avatar manage himself and virtual environment (e. g. interact with PPEs).



Virtual Reality Training

Firefighting: Poolfire, Electric cabin

The activities carried out involved the design and development of further scenarios. As part of the fire-fighting course cluster, the evolution of the Jetfire scenario has been propedeutic to the definition of new storyboards and implementation of the related scenarios: Poolfire and fire Electric Cabin also with Man Down variant.

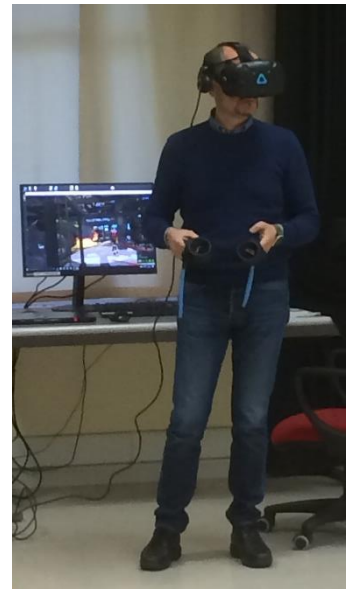
- ***Pool Fire:*** fire of flammable liquid with containment and limitation of possible collateral damage, realistic reproduction of the foaming agent and dynamics according to the surrounding conditions
- ***Electric Cabin:*** fire of an electrical panel inside a cabin with smoke reproduction and dynamics development as a function of the wind. Realistic reproduction of the burnt painting and cabin interior. Ambient lighting modeling
- ***Man Down:*** extension of the previous scenario with the presence of unconscious personnel within the simulation (dynamics of man on the ground)

Virtual Reality Training
Project main features

- The system simultaneously allows the **active use** of the training scenario by **four operators** and **passive use** by the **classroom**.

Sessions:

- **Tutorial:** description of the correct operating sequence using automatic animation and 3D avatar
- **Training:** interactive simulation that allows users avatars to interact with the virtual scenario by using safety devices.
- **Assessment:** interactive session in which each operator will be evaluated according to objective criteria and KPIs defined for the role assigned.



Roles:

- **Tutor:** manages the simulation and follows the operator's actions
- **Operator:** manages the operation sequence
- **Visitor:** passive visitor who can see and hear (but not interact with) the simulation;