



Safety Report

Izvješće o sigurnosti

Petrokemija d.d., Kutina
Hrvatska

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Petrokemija d.d. Kutina, Hrvatska

- **Legal and ownership framework**

- From 1968 to 1996 Petrokemija in various organization types within INA Zagreb;
- 1991 Petrokemija d.d. founded, 100% owned by INA Oil Industry, Zagreb;
- 1998 voucher privatization;
- Since 2003 listed on the Zagreb Stock Exchange;
- Ownership structure:
 - 50,6% Croatian Privatization Fund and Government of Croatia,
 - 49,4% investment funds and private investors.

Petrokemija in figures:

- **Petrokemija Kutina – Croatian and regional brand:**
- 900 million kn in capital;
- 2 billion kn in total revenues;
- **Capacity:**
 - 1,350,000 t / y mineral fertilizers,
 - 32,000 t / y carbon black,
 - 50,000 t / y bentonite-based products;
- 2370 employees.
- One of largest Croatian industrial producers;
- At the very top in chemical and pharmaceutical industry, immediately following Pliva;
- **3rd largest Croatian exporter;**
- **20th largest employer;**
- Ranks **18th** on the domestic companies' **total revenues list.**



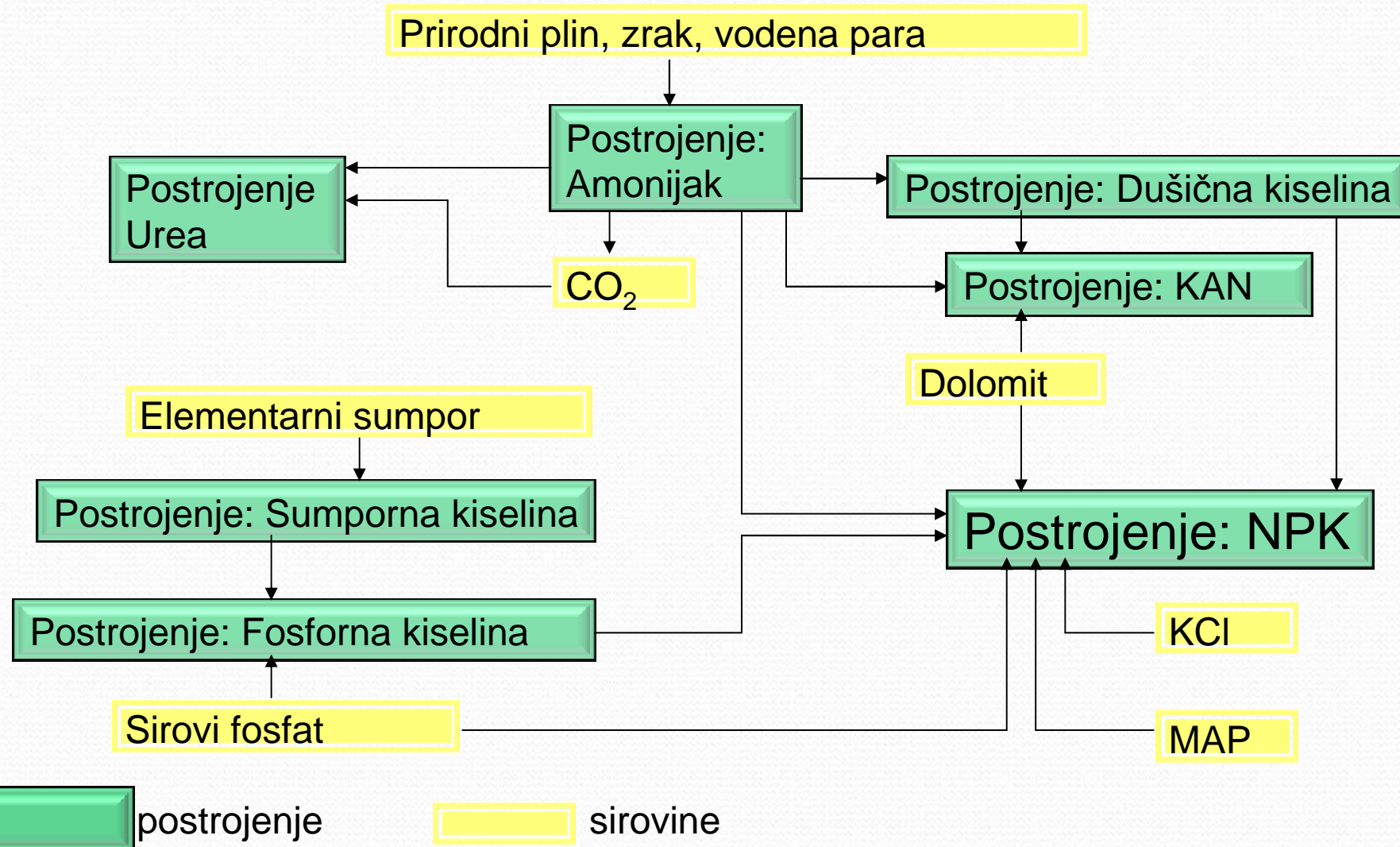
Sales of Products

- wide product range of high-quality products:
 - Complex NPK fertilizer (with nutrients and micro-nutrients),
 - Nitrogen fertilizers (prilled and granular CAN, AN and prilled UREA),
 - Liquid fertilizers,
 - Various carbon black grades,
 - Products for the foundry industry,
 - Animal feed supplements, and
 - Other bentonite-based products.
- own pallet production;
- maintenance activities;



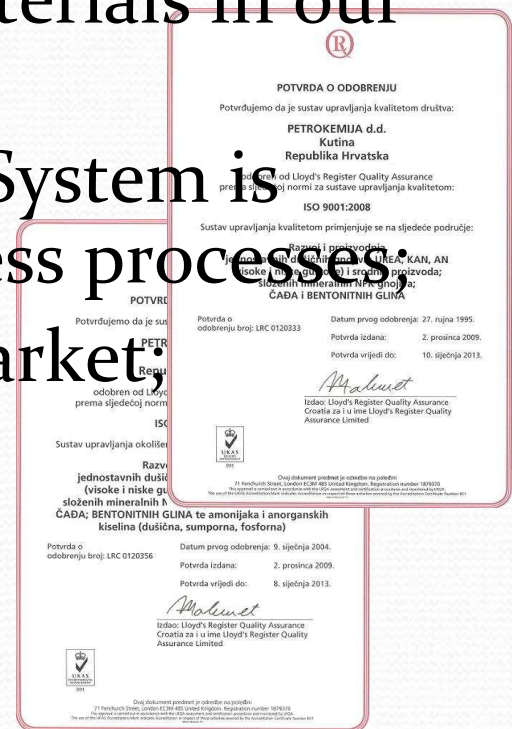
Fertilizers production schema

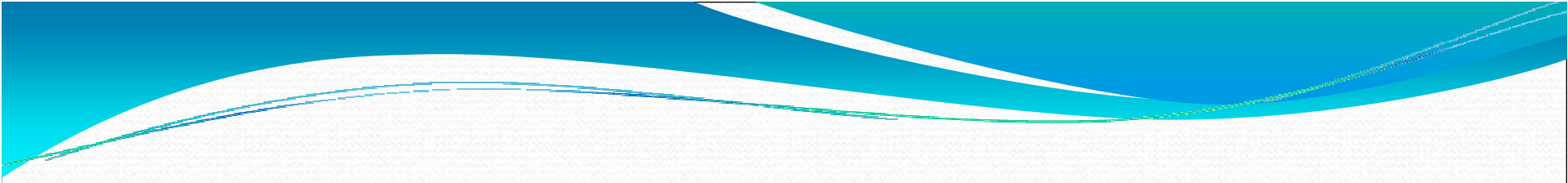
Shema proizvodnje gnojiva



Our Product - Synonym for Quality

- The name Petrokemija is a synonym for high quality producer;
- We use best market available raw materials in our production processes;
- ISO 9001:2008 Quality Management System is used in all our production and business processes;
- The best quality "controller" is the market;
- Our products are sold to:
 - domestic market (40%),
 - world markets (60%).



- 
- We take care of environmental protection and pollution, confirmed by Environmental Management System, in line with the ISO 14001:2004 standard;
 - We have a long term strategy of investments into environmental protection;
 - Environmental protection is carried out through application activities and soil analysis – we give advice on type of fertilization, taking into account optimum yields and soil preservation.

Safety Report

Legal basis

- EC Directive 96/82 (Seveso II) on the control of major-accident hazards involving dangerous substances
- Implementation of Directive 2003/105/EC amending Council Directive 96/82/EC on the control of major-accident hazards involving dangerous substances
- Law on ratification of Convention on the transboundary effects of industrial accidents , MU 7/99
- Law on Environmental Protection, NN 110/07
- Law on chemicals, NN 150/05, 53/08
- National chemical safety strategy 2008/11/28
- Regulation on the control of major-accident hazards involving dangerous substances, NN 114/08

Zakonska osnova

- **Direktiva Vijeća 96/82 EZ od 9. 12.1996. (SEVESO – II) o kontroli opasnosti od velikih nesreća koje uključuju opasne tvari**
- **Implementacija Direktive Vijeća 2003/105/EC o kontroli opasnosti od velikih nesreća koje uključuju opasne tvari**
- **Zakon o potvrđivanju Konvencije o prekograničnim učincima industrijskih nesreća, Narodne novine MU 7/99**
- **Zakon o zaštiti okoliša, NN 110/07**
- **Zakon o kemikalijama N.N 150/05, 53/08**
- **Nacionalna strategija kemijske sigurnosti od 28.11.2008.god.**
- **Uredba o sprječavanju velikih nesreća koje uključuju opasne tvari, Narodne novine 114/08**

Safety Report activity plan

Plan aktivnosti za izradu Izvješća o sigurnosti

- Defining dangerous substances from Annex I and II, EC Directive)
 - What dangerous substances do we have on our plant site?
 - What quantities?
 - Obligations according to criteria from Annex I and II
 - Notification
 - Drafting Safety Report
- Definiranje opasnih tvari iz Priloga I i II Uredbe
 - Koje se od navedenih opasnih tvari nalaze na području tvrtke?
 - Koje su to količine?
 - Obveza po kriterijima Priloga I i II:
 - Obavješćivanje
 - Izrada Izvješća

Safety Report activity plan

Plan aktivnosti za izradu Izvješća o sigurnosti

- Processing demands from Annex I and II
 - Dangerous substances inventory creation with quantities and location in facilities, in cooperation with Environmental Protection Department and Head of facilities.
 - Creation of Notification for dangerous substances in terms of Annex I, Part 1 table.
 - List of dangerous substances for creation of Safety Report
- **Obrada zahtjeva iz Priloga I i II**
 - **Izrada popisa opasnih tvari sa količinama i lokacijama na postrojenjima u suradnji s Odjelom upravljanja okolišem, upraviteljima postrojenja**
 - **Izrada obavijesti za opasne tvari sukladno graničnim količinama iz stupca 2 Priloga I**
 - **Izrada popisa opasnih tvari za koje treba izraditi Izvješće o sigurnosti**

Example

Primjer

Stupac 1.	Stupac 2.	Stupac 3.
Opasne tvari	Granične količine za primjenu (u tonama):	
	Granične količine opasnih tvari kod kojih postoji obveza obavješćivanja	Granične količine opasnih tvari kod kojih postoji obveza izrade Izvješća o sigurnosti

Column 1	Column 2	Column 3
Dangerous substances	Qualifying quantity (tonnes) for the application of	
	Articles 6 and 7	Article 9

List of chemicals and facilities

Popis kemikalija i postrojenja 1/2

Red br.	Kemijski naziv	CAS broj	Naziv po IUPAC	Najveća količina	Lokacija
1	Amonijak	7664-41-7	Amonijak	17.000 tona	Skladište Amonijaka
2.	Dušična kiselina 50-60%	7697-37-2	Dušična kiselina	1.200 t	DUKI-1
				1.200 t	DUKI-2
3.	Amonijev nitrat	6484-52-2	Amonijev nitrat	XXXX	Skladište amonijevog nitrata
5.	Srednje lož ulje LUS II	68553-00-4	Loživo ulje, No. 6	19.000 t	Energana
6.	SO ₂ od izgaranja elementarnog sumpora	7446-09-5	Sumporov (IV) oksid	50.000 t	Skladište sumpora

List of chemicals and facilities

Popis kemikalija i postrojenja 2/2

7.	Dekantirano ulje + LUS II	64741-62-4 68553-00-4	Dekantirano ulje Loživo ulje, No.6	1.600 t	Proizvodnja Čađe
8.	Antracensko ulje	90640-86-1	Antracensko ulje	2.000 t	Proizvodnja Čađe
9.	Pirolizno ulje	68513-69-9	Pirolizno ulje	3.000 t	Proizvodnja Čađe
10.	Procesna mješavina ulja pod 7,8,9	64741-62-4 68553-00-4 90640-86-1 68513-69-9	Procesna mješavina	1.600 t	Proizvodnja Čađe

Safety Report activity plan

Plan aktivnosti za izradu Izvješća o sigurnosti

- Delivering information to the State Ministry in accordance with demands of Annex I and II
 - On formal template in Annex II:
 - (description of the site and location of the facilities, measures for disabling and mitigation of sudden event, data for hazard substances on facilities)

- Dostava obavijesti sukladno zahtjevima Priloga I i II nadležnom Ministarstvu
 - Na propisanom obrascu iz Priloga II:
 - (opći podaci o tvrtki, lokacija postrojenja, mjere sprečavanja i ublažavanje posljedica iznenadnog događaja, podaci o opasnim tvarima kojih je prisutnost utvrđena u postrojenju)



Contents of the Safety Report

Sadržaj Izvješća o sigurnosti

Politika sprječavanja velikih nesreća

- **Adopted formally**
- **OBJECTIVE:** Our objective is to work without injuries, professional illness, harmful effects of work on employees health, as well as protection of properties by implementation of rules and regulation of Safety, Fire protection, Security and other mentioned principles in accident-free environment.
- **Formalno prihvaćena**
- **CILJ:** Naš cilj je rad bez ozljeda, profesionalnih bolesti, štetnih utjecaja rada na zdravlje radnika te zaštita imovine primjenom propisanih i priznatih pravila zaštite na radu, zaštite od požara, tjelesno-tehničke zaštite i navedenih načela sigurnosti u sigurnom okruženju.

Politika sprječavanja velikih nesreća

- Company has to be a safe workplace for all employees, contractors and visitors.
 - Responsibility for Safety is not transferable. Each employee of Petrokemija is fully responsible for personal safety and for the safety of his surroundings.
 - Petrokemija shall not make any business decision that lowers or jeopardize the concern about safety of work and environment.
 - Written procedures for conducting extraordinary events shall be continuously practised, analysed and constantly improved.
- **Poduzeće mora biti sigurno mjesto rada za sve radnike i kooperante, te posjetitelje.**
 - **Odgovornost za sigurnost je neprenosiva. Svaki radnik Petrokemije u potpunosti je odgovoran za osobnu sigurnost i sigurnost svoje okoline.**
 - **Petrokemija neće donijeti niti jednu poslovnu odluku koja bi umanjila ili ugrozila brigu o sigurnosti rada i okruženja.**
 - **Propisani postupci za ponašanje u izvanrednim okolnostima moraju se stalno uvježbavati, analizirati i prema potrebi unapređivati.**

SMS Sustav upravljanja sigurnošću

- Addresses all 7 aspects as in Annex III
 - organization and personnel
 - identification and evaluation of major hazards
 - operational control
 - management of change
 - emergency planning and response
 - monitoring
 - audit and review

- **Sukladno 7 zahtjeva Priloga III**
 - **organizacija i osoblje**
 - **utvrđivanje i procjena rizika**
 - **nadzor rada postrojenja**
 - **upravljanje promjenama**
 - **planiranje intervencija**
 - **praćenje rada**
 - **revizija i pregled**

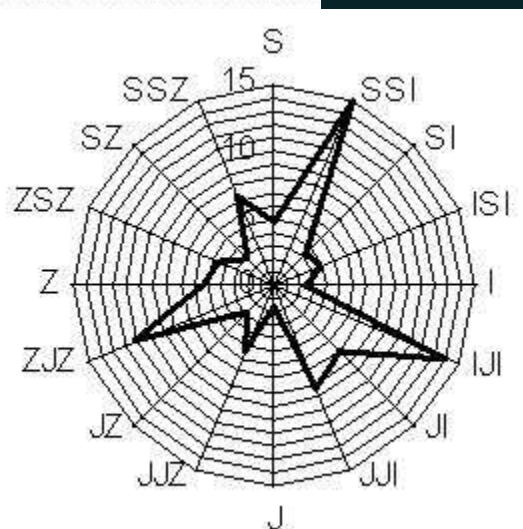
Data and information obligated in Safety Report , defined by Annex III **Podaci i informacije koje mora sadržavati Izvješće o sigurnosti - Prilog III Uredbe (II A)**

- Facility location description
 - Middle region of Croatia
 - By the south side of Moslavina mountain
 - Near the Nature park
- Plant site description and it`s environment
 - On approx. 130 ha
- Geographyc location
 - Approx. 1.2 km SE from the City

- **Opis lokacije postrojenja**
 - **Središnja Hrvatska**
 - **Uz južne obronke Moslavačke gore**
 - **Blizina Parka prirode**
- **Opis područja tvrtke i okoline**
 - **Na cca 130 ha**
- **Geografska lokacija**
 - **Okolo 1.2 km JI od Grada**

- Meteorological, geological and hydrographic conditions

- Wind rose
- Geological data
 - 70% subsurface area till 30 m depth consists of medium plastic clay



Meteorološki, geološki, hidrografski uvjeti

- Ruža vjetrova
- Geološki uvjeti područja – na osnovi poznatih geoloških ispitivanja
 - 70% polu prostora dubinskog dosega 30 m izgrađuje srednje plastična glina

Identification of installations with major-accident hazard

Identifikacija postrojenja koja predstavljaju rizik od velikih nesreća (II B)

- Tanks for:
 - Ammonia
 - Sulphuric acid
 - Nitric acid
 - Power plant- fuel oil
 - Oil feedstock on Carbon Black Plant
- Storages:
 - Sulphur
 - Ammonium nitrate

- Spremnici:
 - Amonijaka
 - Sumporne kiseline
 - Dušične kiseline
 - Lož ulja za Energanu
 - Uljne sirovine za proizvodnju Čađe
- Skladišta:
 - Sumpora
 - Amonijevog nitrata

(II C)

- Description of areas with possible Domino effect in case of major-accident
 - Ammonium nitrate storage

- Opis područja mogućeg domino efekta u slučaju velike nesreće
 - Skladište amonijevog nitrata

Tehnološki opis postrojenja (III A, B)

• Description of production process

- Ammonia: based on Kellogg method (catalytic reforming of natural gas, N, CO₂, water steam)
- Nitric acid : based on Grande Paroisse method
- Sulphuric acid: based on contact method DC/DA with 99,7% SO₂ → SO₃ conversion
- Ammonium nitrate: based on Kaltenbach method

• Process conditions:

- State of substance in process
- Pressure
- Temperature
- Process equipment

• Opis procesa proizvodnje

- Amonijak: koncipiran na Kellogg metodi (katalitičko reformiranje prirodnog plina: H, vodena para, N, CO₂, NH₃)
- Dušična kiselina: koncipirana na Grande Paroisse metodi
- Sumporna kiselina: kontaktni postupku DK/DA sa 99,7% konverzijom SO₂ u SO₃
- Amonijev nitrat: koncipiran po Kaltenbach metodi

• Opis procesnih uvjeta:

- Agregatno stanje tvari u proces
- Tlak
- Temperatura
- Procesna oprema

List of Dangerous substances **Popis opasnih tvari (IIIC)**

Kemijski naziv	CAS broj	Oznake upozorenja i obavijesti	Oznaka opasnosti	Najveća količina	Lokacija
1). Amonijak	7664-41-7	R:10-23-34-50 S: 1/2-9-16-26-36/37/39-45-61	T, C, N	17.000 tona	Skladište Amonijaka
2). Dušična kiselina 50-60%	7697-37-2	R: 8-35 S: 1/2-23-26-36-45	O, C	1.200 t 1.200 t	DUKI-1 DUKI-2
3). Amonijev nitrat	6484-52-2	R 8,9 S 15,16,41	O	XXXX	Skladište amonijevog nitrata
4). Srednje lož ulje LUS II	68553-00-4	R: 45-65-66-52/53 S: (2-)45-53-61-62	T, Karc.kat.2	19.000 t	Energana
SO ₂	7446-09-5	R: 23, 34 S: ½, 9, 26, 36/37/39,45	T,C	50.000 t	Skladište sumpora

List of Dangerous substances

Popis opasnih tvari

(IIIC)

5). Dekantirano ulje + LUS II	64741-62-4 68553-00-4	R: 45-52/53- 66 S:53-45-61	T, Karc.kat.2	1.600 t	Proizvodnja Čađe
6). Antracensko ulje	90640-86-1	R:45 S:53, 45	T, Karc.kat.2	2.000 t	Proizvodnja Čađe
7). Pirolizno ulje	68513-69-9	R:45, 52/53, 66 S: 45, 53, 61	T, Karc.kat.2	3.000 t	Proizvodnja Čađe
Procesna mješavina ulja pod 5,6,7	64741-62-4 68553-00-4 90640-86-1 68513-69-9	R: 45-52/53- 66 S:53-45-61 R:45 S:53, 45 R:45, 52/53, 66 S: 45, 53, 61	T, Karc.kat.2	1.600 t	Proizvodnja Čađe

Possible scenarios

Mogući scenariji za sve tvari (IV A)

- Ammonia-tank wall rupture
- Sulphur-fire of stored sulphur
- Fuel oil-tank rupture
- Acids-tank rupture
- Ammonium nitrate-explosion
- Scenarios (worst-case) have been made for all dangerous substances

- Amonijak-proboj spremnika
- Sumpor-zapaljenje uskladištenog sumpora
- Ulje-proboj spremnika
- Kiseline-proboj spremnika
- Amonijev nitrat-eksplozija
- Scenariji (worst-case) su izrađeni za sve opasne tvari

- Major hazard risk identification and analysis , safety procedures for prevention

- HAZOP Study creation for each facility that contains dangerous substances in quantities that commit us to make Safety Report
- Process schematic analysis, marking nodes
- Analysing nodes
 - What if
 - Guiding words...

- **Utvrđivanje i analiza rizika od nesreća te način sprečavanja**

- Izrada HAZOP studije za svako postrojenje na kojem je opasna tvar u količinama za koje je potrebno izraditi Izvješće o sigurnosti
- Analiza procesnih shema, označavanje “čvorova”
- Analiza čvorova
 - Što ako
 - Riječi vodilje...

HAZOP Study

Poremećaj Deviation	Uzrok Causes	Posljedice Consequences	Ugrađene zaštitne mjere Safeguards	Preporuke, zadaje Recommendations	Nesreća / accident			Preporu ke Recome ndations
					I	F	R	
Proboj tekuće faze amonija ka u tankvan u	Ošteće nje na plaštu sprem nika	Zagađenje okoline ovisno o vremenski m uvjetima	LSH-oo6 sklopka (alarm) visokog nivoa u tankvani	Obustaviti napajanje i pothlađivanje spremnika. Prekriti tankvanu zaštitnim slojem pjene	I	E	4	4
Liquid phase NH ₃ entering confinement	Tank wall damag e	Environm ent pollution depending on meteorolo gicall conditions	LSH-oo6 switch (alarm) for high level in confinement	STOP tank padding and cooling. Cover ammonia inside confinement with foam.	I=Intenzitet; F=Frekvencija; R=Rizik;			

Primjer klasificiranja prema intenzitetu

Oznaka	Intenzitet
I	Gubitak života djelatnika ili teške ozljede među lokalnim stanovništvom Štete i gubitak produktivnosti veći od \$ 1.000.000
II	Teške ozljede djelatnika ili lakše ozljede među lokalnim stanovništvom Štete i gubitak produktivnosti od \$ 100.000 do \$ 1.000.000
III	Lakše ozljede djelatnika Štete i gubitak produktivnosti od \$ 10.000 do \$ 100.000
IV	Bez ozlijeđenih Štete i gubitak produktivnosti manje od \$ 10.000

Primjer klasificiranja prema frekvenciji

Oznaka	Frekvencija (nesreća/god.)
A	> 1
B	$1 - 10^{-1}$
C	$10^{-1} - 10^{-2}$
D	$10^{-2} - 10^{-4}$
E	$< 10^{-4}$

Primjer klasificiranja prema riziku

		Frekvencija				
		A	B	C	D	E
Intenzitet	I	1	1	1	2	4
	II	1	2	3	3	4
	III	2	3	4	4	4
	IV	4	4	4	4	4

Oznaka	Značenje	Preporuke
1	Neprihvatljiv	Reducirati na kategoriju 3 ili 4 što je prije moguće
2	Nepoželjan	Reducirati na kategoriju 3 ili 4
3	Prihvatljiv uz povećan oprez	Provjeriti djelotvornost procedura i zaštitnih mjera
4	Prihvatljiv	Nikakve aktivnosti nisu potrebne

Hazard evaluation / Procjena dosega (IV B)

- Major-hazard severity, reach and impact evaluation using software tools: SAFER TRACE and SAFER Real-Time.
 - HAZOP data analysis
 - Possible malfunctions
- Pipeline rupture
- Junktion rupture
- Tank wall rupture
- Pump rupture
- Liquid phaze release
- Gas phase release

- **Procjena dosega i ozbiljnost posljedica velikih nesreća programskim alatom SAFER TRACE i SAFER Real-Time .**
 - **Analiza podataka na osnovu HAZOP studija**
 - **Odabir mogućih poremećaja**
 - **Puknuće cjevovoda**
 - **Proboj na spojevima**
 - **Proboj na stijenci spremnika**
 - **Proboj na pumpi**
 - **Proboj tekuće faze**
 - **Proboj plinske faze**

Hazard evaluation / Procjena dosega

- Fire
- Explosion
- Impact
 - Surrounding objects
 - Surrounding area
 - Inhabitants
 - Infrastructure
 - Evacuation YES/NO
 - When, which area

- Požar
- Eksplozija
- Doseg i utjecaj
 - Na okolne objekte
 - Na okolna područja
 - Stanovništvo
 - Infrastruktura
 - Evakuacija DA/NE
 - Kada, koja područja

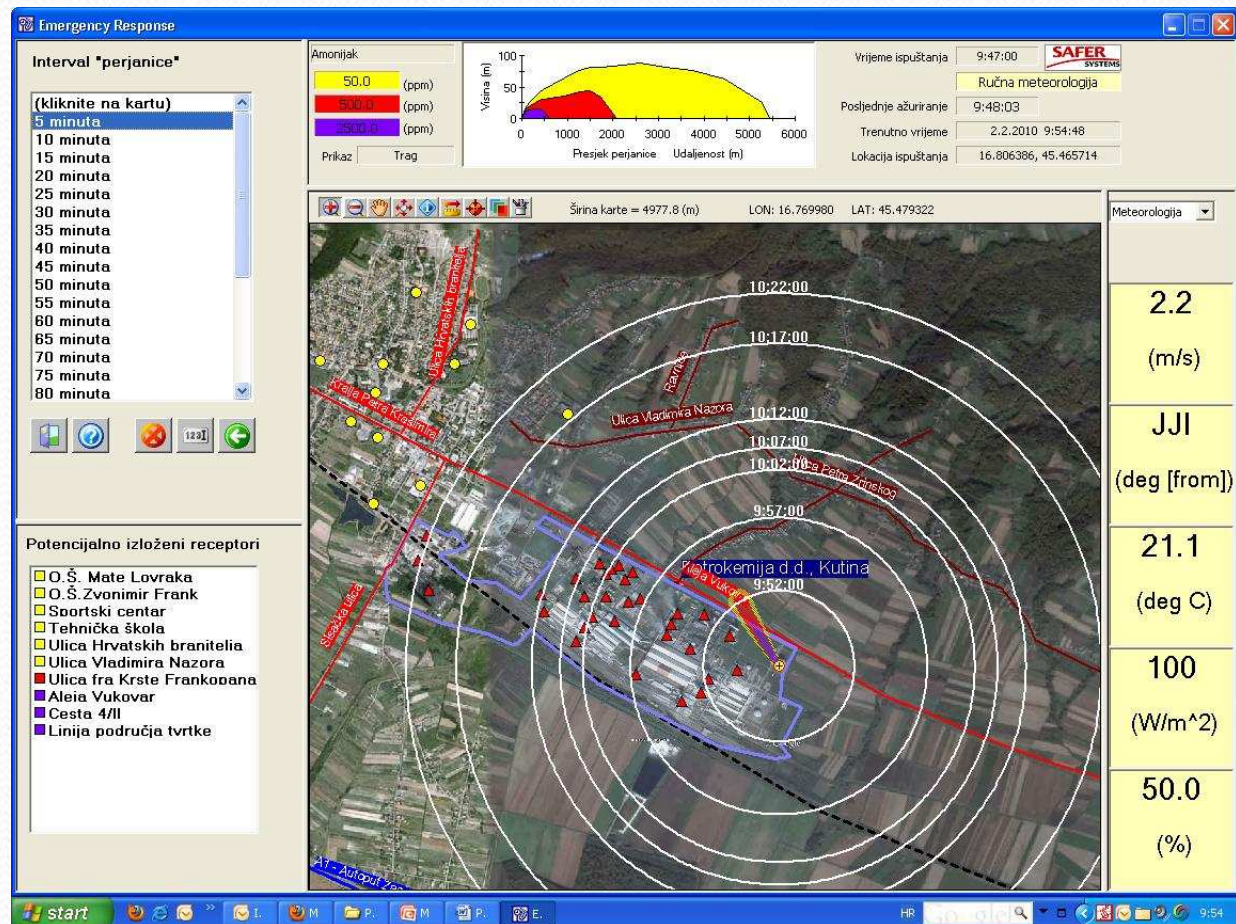
Example / **Primjer**

- Ammonia tank wall rupture-release of liquid ammonia inside confinement
- Duration= 20 minutes
- Release rate=500 kg/min
- Release temp.= -33°C
- Release height = 3m

- **Proboj amonijaka na stjenki spremnika- ispuštanje tekućeg amonijaka u tankvanu**
- **Trajanje = 20 min**
- **Brzina ispuštanja=500 kg/min**
- **Temp. Ispuštanja = -33°C**
- **Visina ispuštanja = 3m**

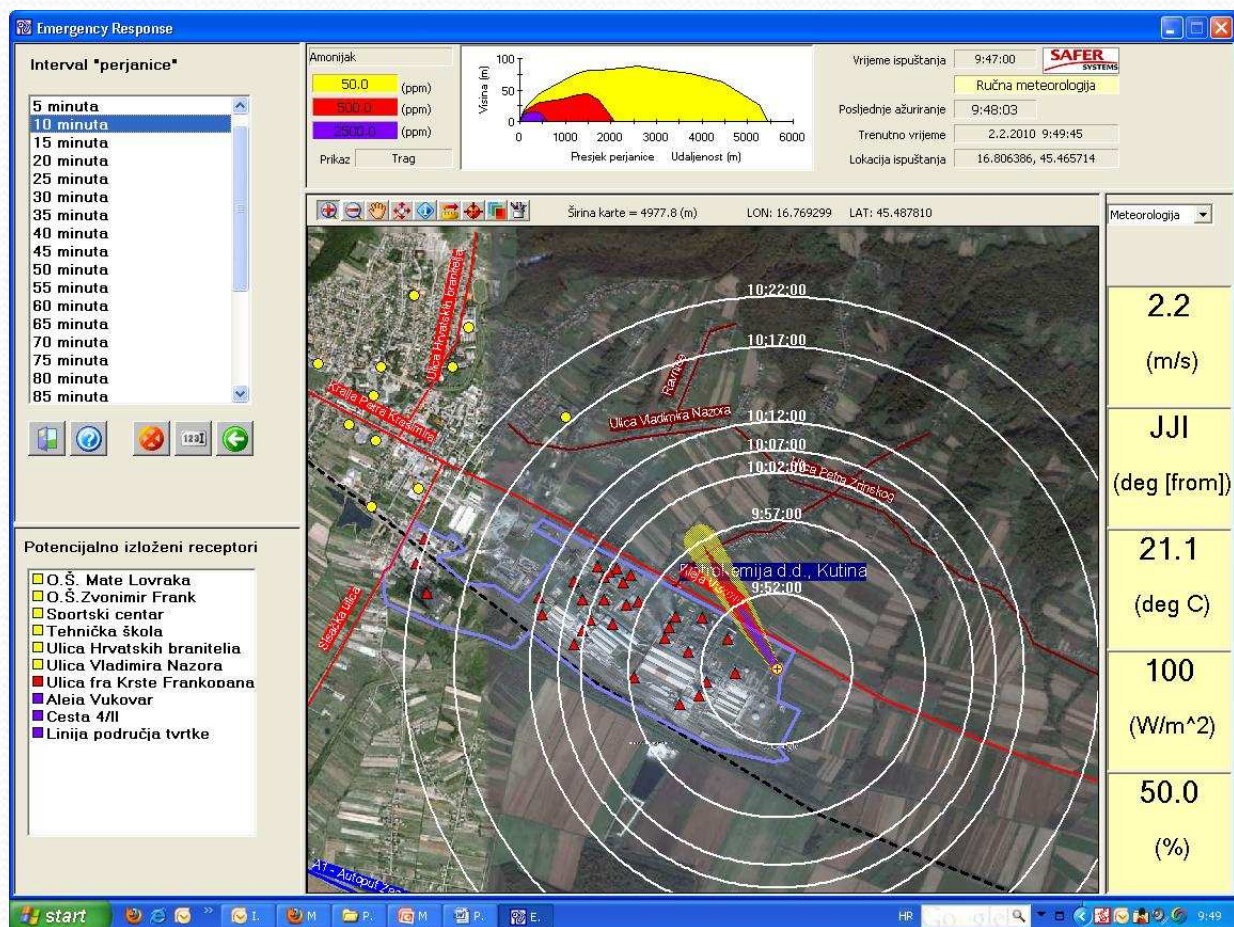
5 min after release

5 minuta nakon početka ispuštanja



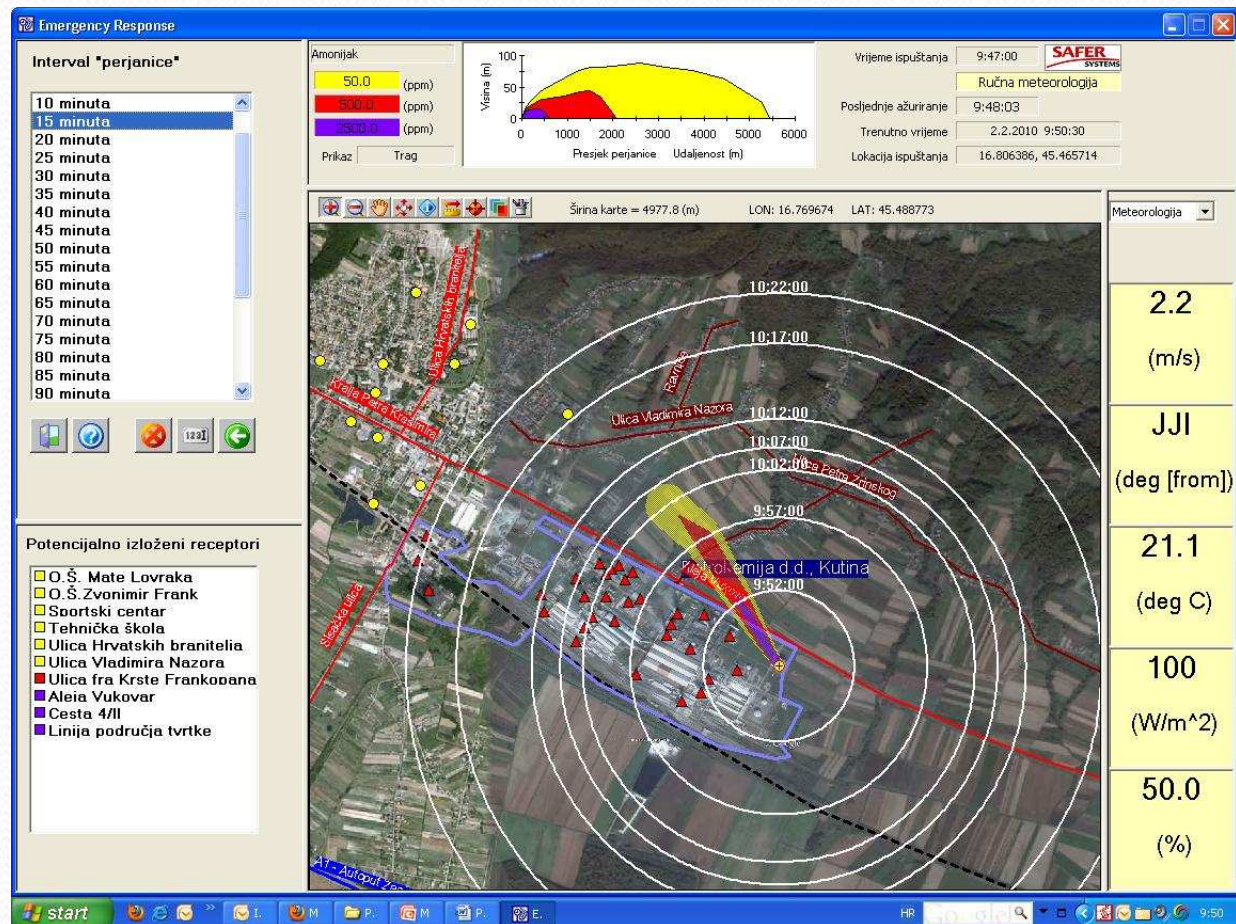
10 min after release

10 minuta nakon početka ispuštanja



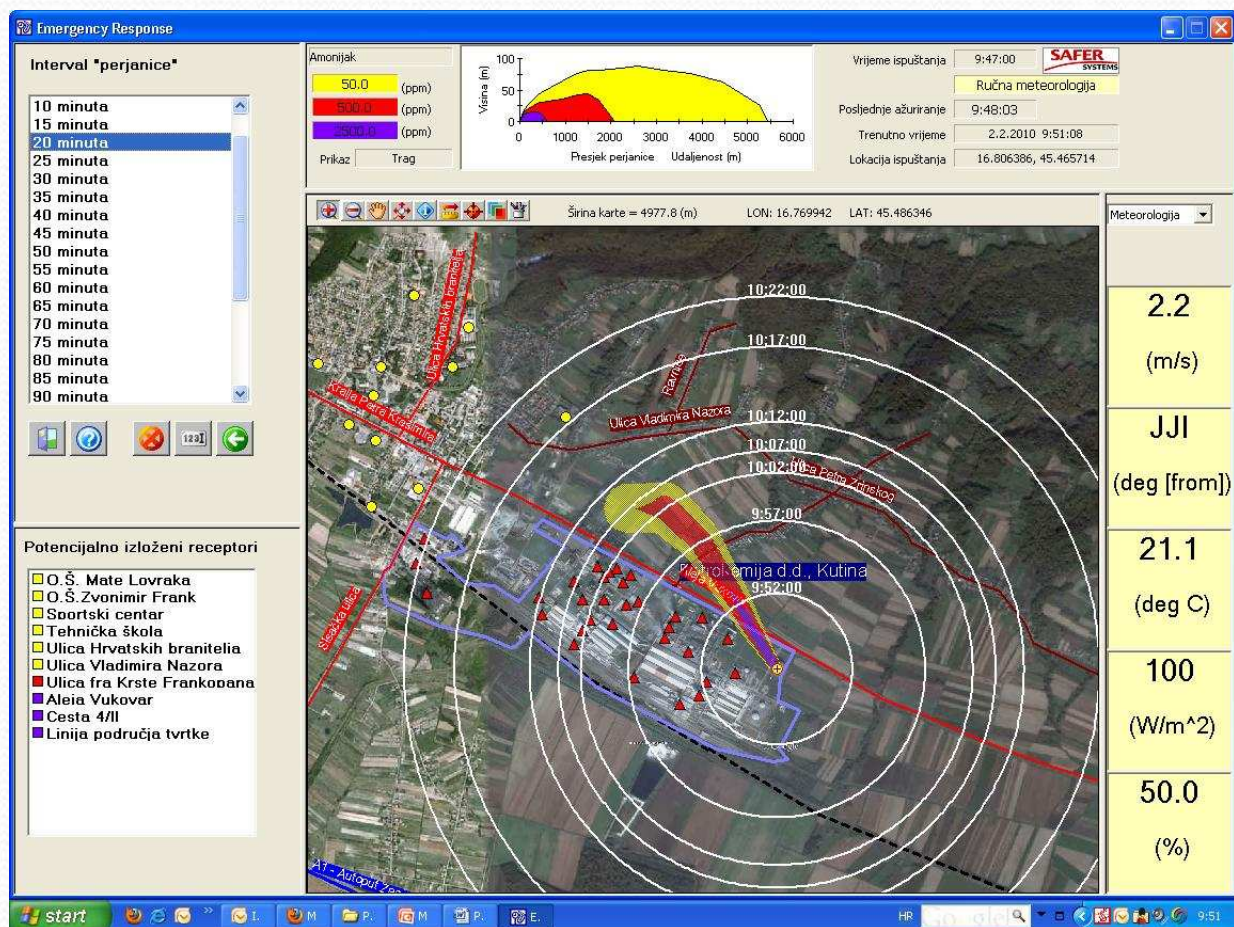
15 min after release

15 minuta nakon početka ispuštanja



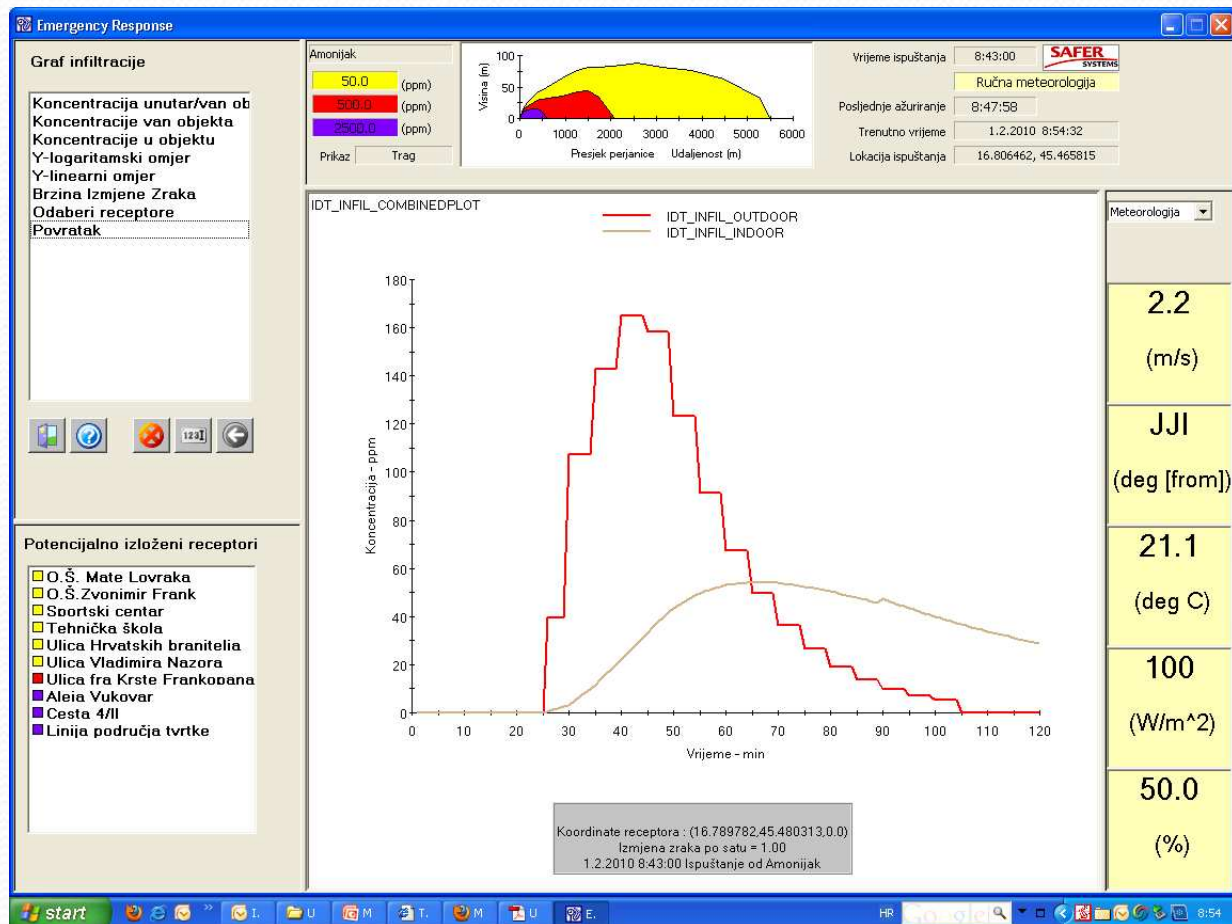
20 min after release

20 minuta nakon početka ispuštanja

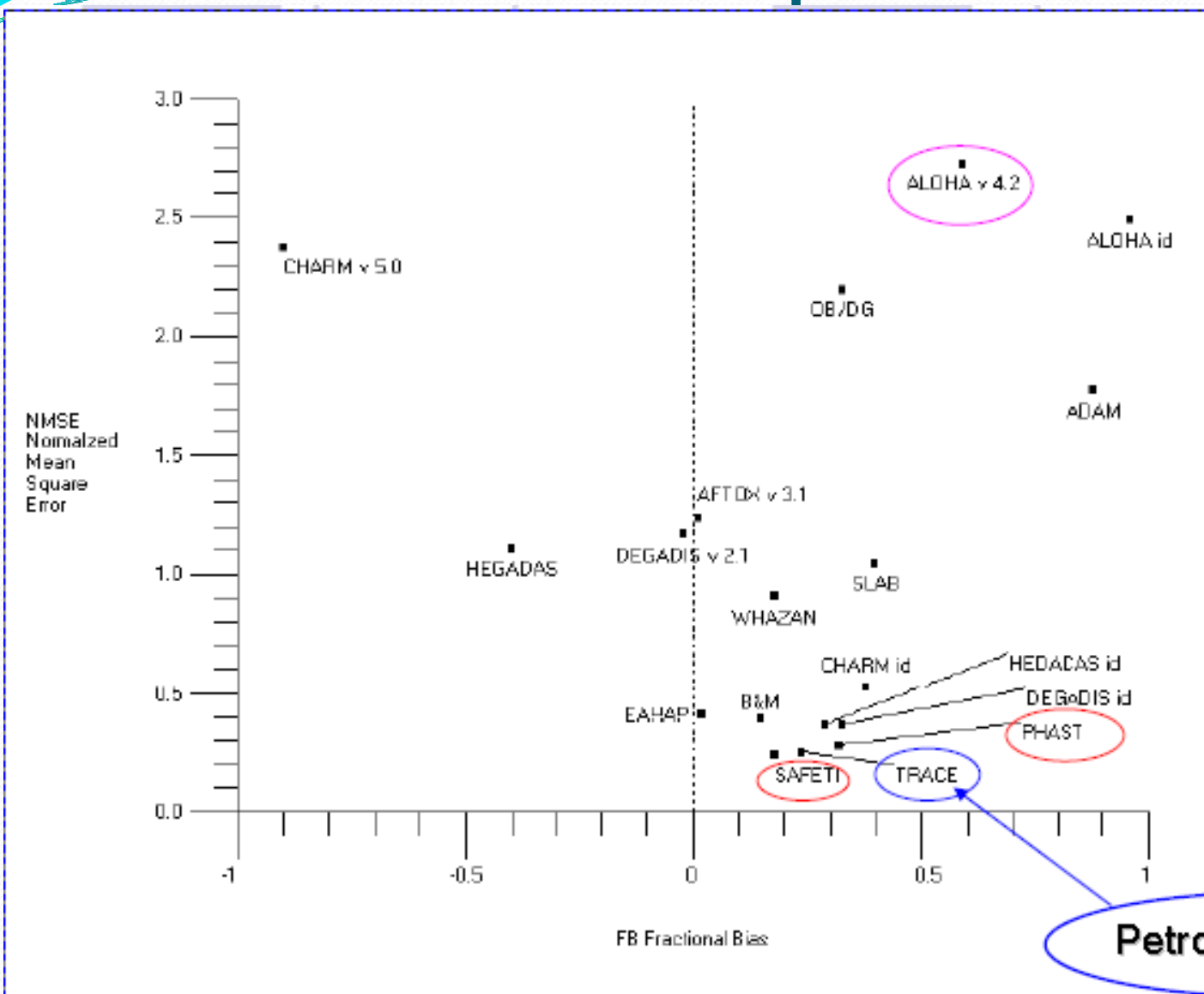


Receptor analysis

Analiza receptora



Different SW models comparison



NMSE generally shows the most striking differences among models. If a model has a very low NMSE, then it is well performing both in space and time.

On the other hand, high NMSE values do not necessarily mean that a model is completely wrong. That case could be due to time and/or space shifting

Petrokemija, Kutina

(V)

- Measures for prevention and responding with aim to confine major-hazard consequences
 - Fixed foam system to prevent ammonia evaporation
 - Tested and certified
 - 3000 l of foam agent in vessel
 - 6% dosage
 - 5 min to cover confinement with layer of foam to prevent ammonia evaporation

- **Mjere zaštite i interventne mjere za ograničavanje posljedica nesreće:**
 - **Stabilni sustav za sprječavanje evaporacije amonijaka**
 - **Testiran i certificiran**
 - **3000 l pjenila u spremniku**
 - **Doziranje 6%**
 - **za 5 minuta prekriva cijelu tankvanu slojem pjene dovoljnim da spriječi daljnje isparavanje**

Emergency respond planing

Izrada Plana zaštite i spašavanja

- Internal emergency plan for managing accidents with large quantities of dangerous substances
 - Emergency plans for managing accidents with small quantities of dangerous substances
- **Unutarnji plan za postupanja kod nesreća s velikim količinama opasnih tvari**
 - **Operativni planovi postupanja kod nesreća s malim količinama opasnih tvari**

Information communicated to the public

Informiranje javnosti o nesreći

- Information about accident
 - Information about measures for protection
 - Activities undertaken by the Operator (plant site)
 - Information about activities taken, time framed
- **Obavijest o nastanku nesreće**
 - **Informacije o mjerama zaštite**
 - **Aktivnosti poduzete u prostoru Operatera**
 - **Obavijesti o tijeku aktivnosti u određenim vremenskim razmacima**



Thank you for your
attention

Hvala na pažnji