

위험성 평가제도와 산업안전보건법

2007. 8. 9

박두용



한국산업안전공단
산업안전보건연구원

Risk Assessment

Five steps **TO** **risk assessment**



STEP 1

Hazard

Look only for hazards which you could reasonably expect to result in significant harm under the conditions in your workplace. Use the following examples as a guide

- slipping/tripping hazards (eg poorly maintained floors or stairs)
- fire (eg from flammable materials)
- chemicals (eg battery acid)
- moving parts of machinery (eg blades)
- work at height (eg from mezzanine floors)
- ejection of material (eg from plastic moulding)
- pressure systems (eg steam boilers)
- vehicles (eg fork-lift trucks)
- electricity (eg poor wiring)
- dust (eg from grinding)
- fumes (eg welding)
- manual handling
- noise
- poor lighting
- low temperature

STEP 2

Who might be harmed?

There is no need to list individuals by name - just think about groups of people doing similar work or who may be affected, eg

- office staff
- maintenance personnel
- contractors

- people sharing your workplace
- operators
- cleaners
- members of the public

Pay particular attention to:

- staff with disabilities
- visitors
- inexperienced staff
- lone workers

They may be more vulnerable

STEP 3

Is more needed to control the risk?

For the hazards listed, do the precautions already taken:

- meet the standards set by a legal requirement?
- comply with a recognised industry standard?
- represent good practice?
- reduce risk as far as reasonably practicable?

Have you provided:

- adequate information, instruction or training?
- adequate systems or procedures?

If so, then the risks are adequately controlled, but you need to indicate the precautions you have in place. (You may refer to procedures, company rules, etc.)

Where the risk is not adequately controlled, indicate what more you need to do (the 'action list')

STEP 5

Review and revision

Set a date for review of the assessment (see opposite).

On review check that the precautions for each hazard still adequately control the risk. If not indicate the action needed. Note the outcome. If necessary complete a new page for your risk assessment.

Making changes in your workplace, eg when bringing in new

- machines
- substances
- procedures

may introduce significant new hazards. Look for them and follow the 5 steps.

RISK ASSESSMENT FOR

Company Name _____

Company Address _____

Postcode _____

ASSESSMENT UNDERTAKEN

(date) _____

Signed _____

Date _____

ASSESSMENT REVIEW

Date _____

STEP 1

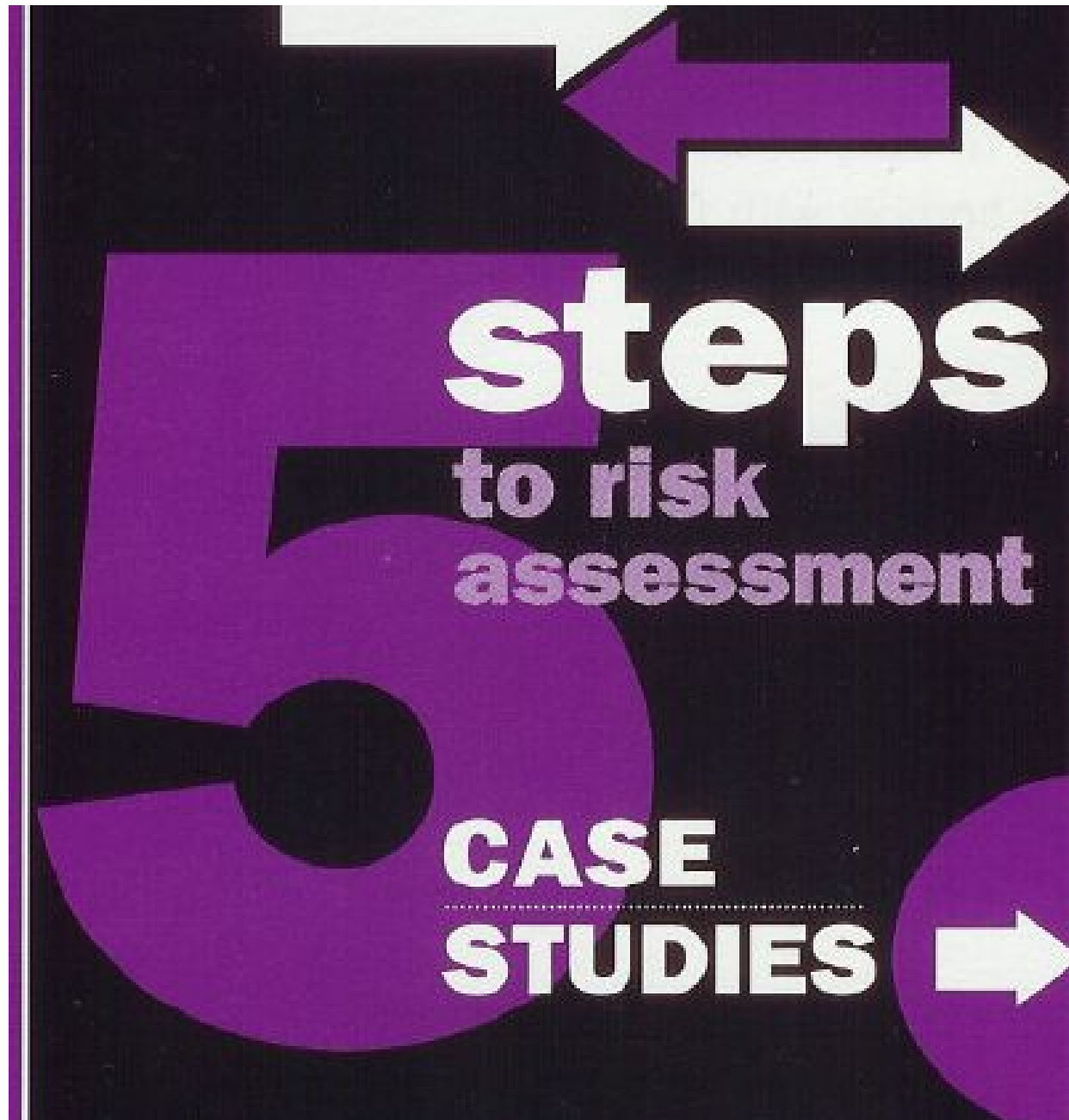
List significant hazards here:

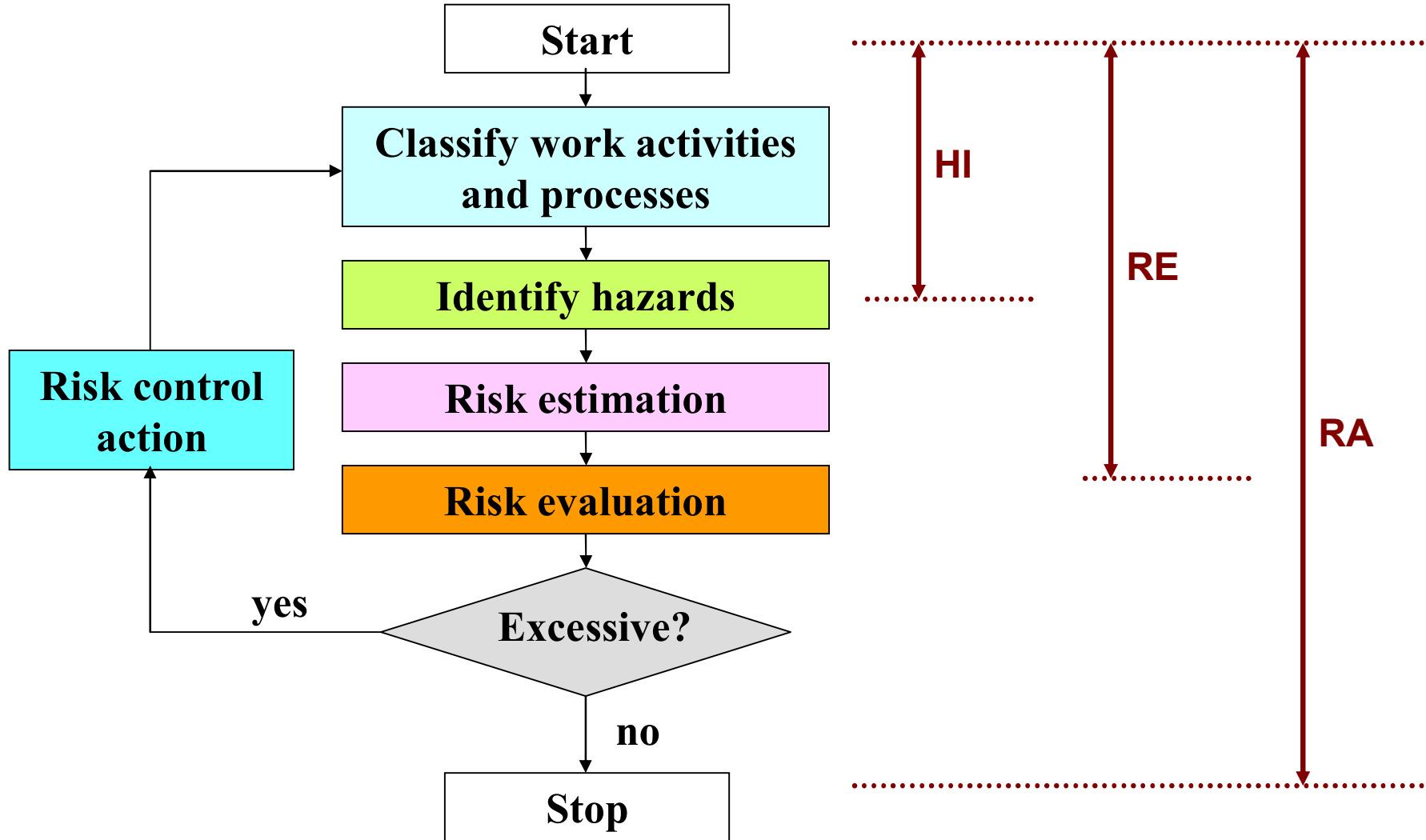
STEP 2

List groups of people
who are at risk from the
significant hazards you
have identified:

STEP 3

List existing controls or note
where the information may be
found. List risks which are not
adequately controlled and the
action needed:





STEP 1. Classify Work Activity

STEP 2. Identify Hazards

STEP 3. Risk Estimation

STEP 4. Risk Evaluation

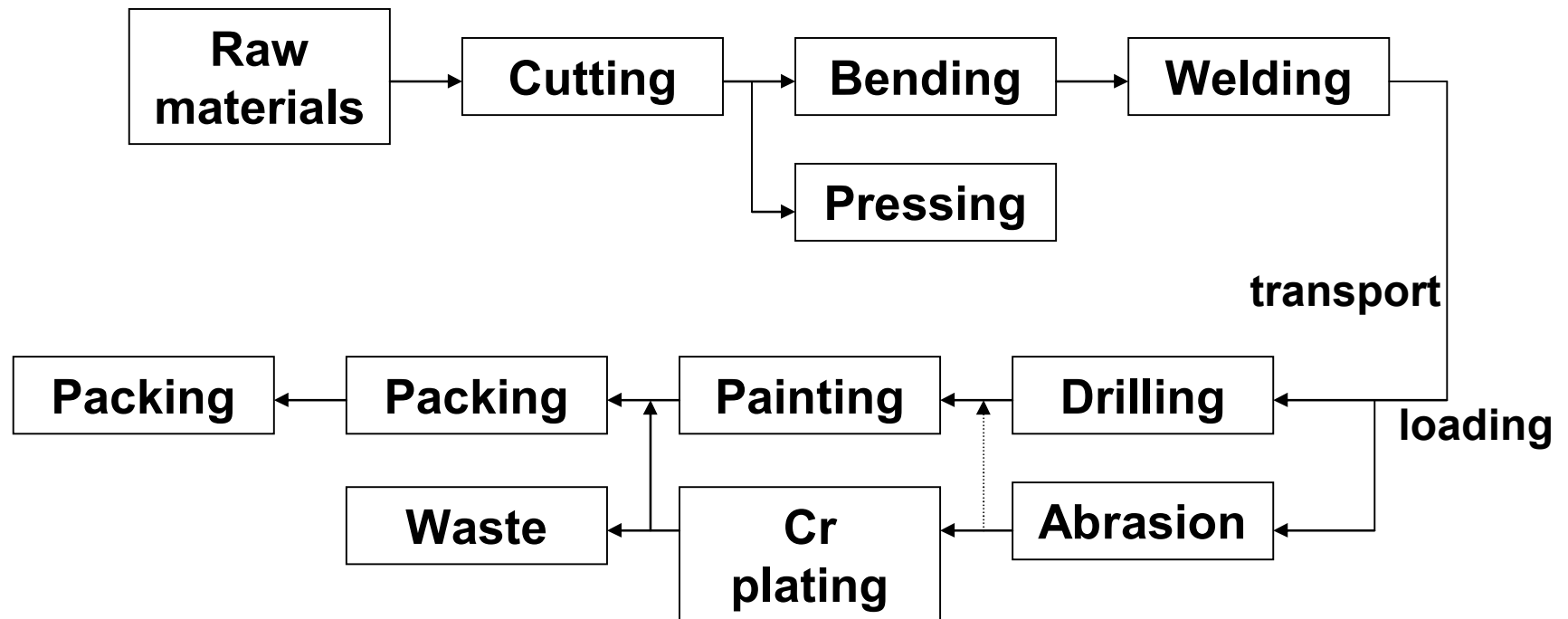
STEP 5. Risk Control

STEP 1. Classify Work Activity

By Work area or Process

HEG: Homogeneous Exposure Group
SEG: Similar Exposure Group

Process Flow Chart



List of Processes for RA			Prepared by	Reviewed by	Approved by
Department:			Team:		
Serial No	Process	RA No.	Serial No	Process	RA No.

STEP 2. Identify Hazards

Hazard

means anything that can cause harm (e.g. chemicals, electricity, working from ladders, etc)

STEP 3. Risk Estimation

Risk

is the chance, high or low, that somebody will be harmed by the hazard.

Risk = Probability x Severity

chance to occur
exposure level & duration

degree of injury, ill-health
magnitude of damage & loss

Probability of events (example)

Possibility	Level	Example
Very low	1	Once per 10 years
Low	2	Once per 3 years
Medium	3	Once every year
High	4	Once every month
Very high	5	Once every day

Severity of events (example)

Magnitude	Level	Example
No effect	1	No injury
Minor	2	Minor health effect, no workday loss
Medium	3	Injury with workday loss
Severe	4	Fatal or severe injury resulted in disability

Table for Risk Estimation

		Severity	No effect	Minor	Medium	Severe
Possibility	Level	1	2	3	4	
Very low	1					
Low	2					
Medium	3					
High	4					
Very high	5					

Table for Risk Estimation

	Severity		No effect	Minor	Medium	Severe
Possibility	Level	1	2	3	4	
Very low	1	1	2	3	4	
Low	2	2	4	6	8	
Medium	3	3	6	9	12	
High	4	4	8	12	16	
Very high	5	5	10	15	20	

STEP 4. Risk Evaluation

Table for Risk Estimation

Risk		Control	Risk
1~3	Ignorable	Not required	Acceptable
4~6	insignificant	Required to provide Information and training	
7~8	Minor	Administrative management required as per labeling, work procedure	
9~12	Considerable	Required to prepare control measures during periodical repairs	Conditionally acceptable
13~15	Serious	Required to set up immediate temporary safety control measures and fundamental measure during periodic repair process	
16~20	Not acceptable	Immediate ceasing(to resume the work, it is required to implement immediate, proper control measures)	Not acceptable

STEP 5. Risk Control Action

- **According to the RA → Proper actions**
- **Control Hierarchy**
- **ALARP**
(As Low As Reasonably Practicable)



Elimination

SUBSTITUTION

**ENGINEERING
CONTROLS**

ADMINISTRATIVE CONTROLS

PERSONAL PROTECTIVE EQUIPMENTS

Is that all?

Yes!

그런데 왜들 그렇게 난리냐?

FAQ

- 1. Risk Assessment는 누가 실시합니까?**
- 2. 너무 간단한 거 아닙니까?**
- 3. 제대로 평가가 가능하겠습니까?**

MIHA COMPREHENSIVE CIH REVIEW COURSE

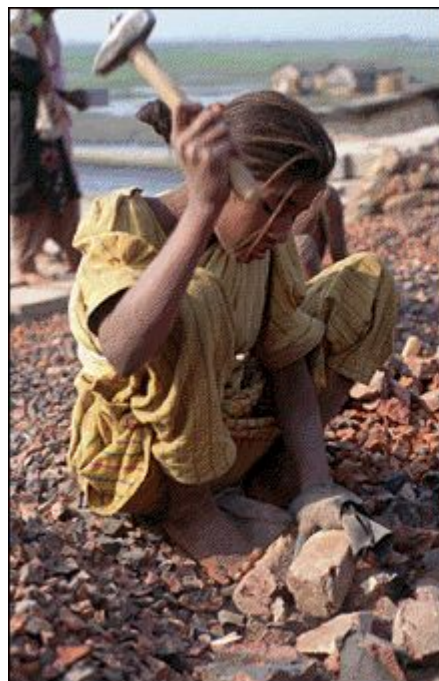
**BY
PROF. PARK DOOYONG, CIH**

**CO-SPONSORED BY
SONG**

AUGUST 20



***Is child labor problem
serious in Korea?***



Focus on Children



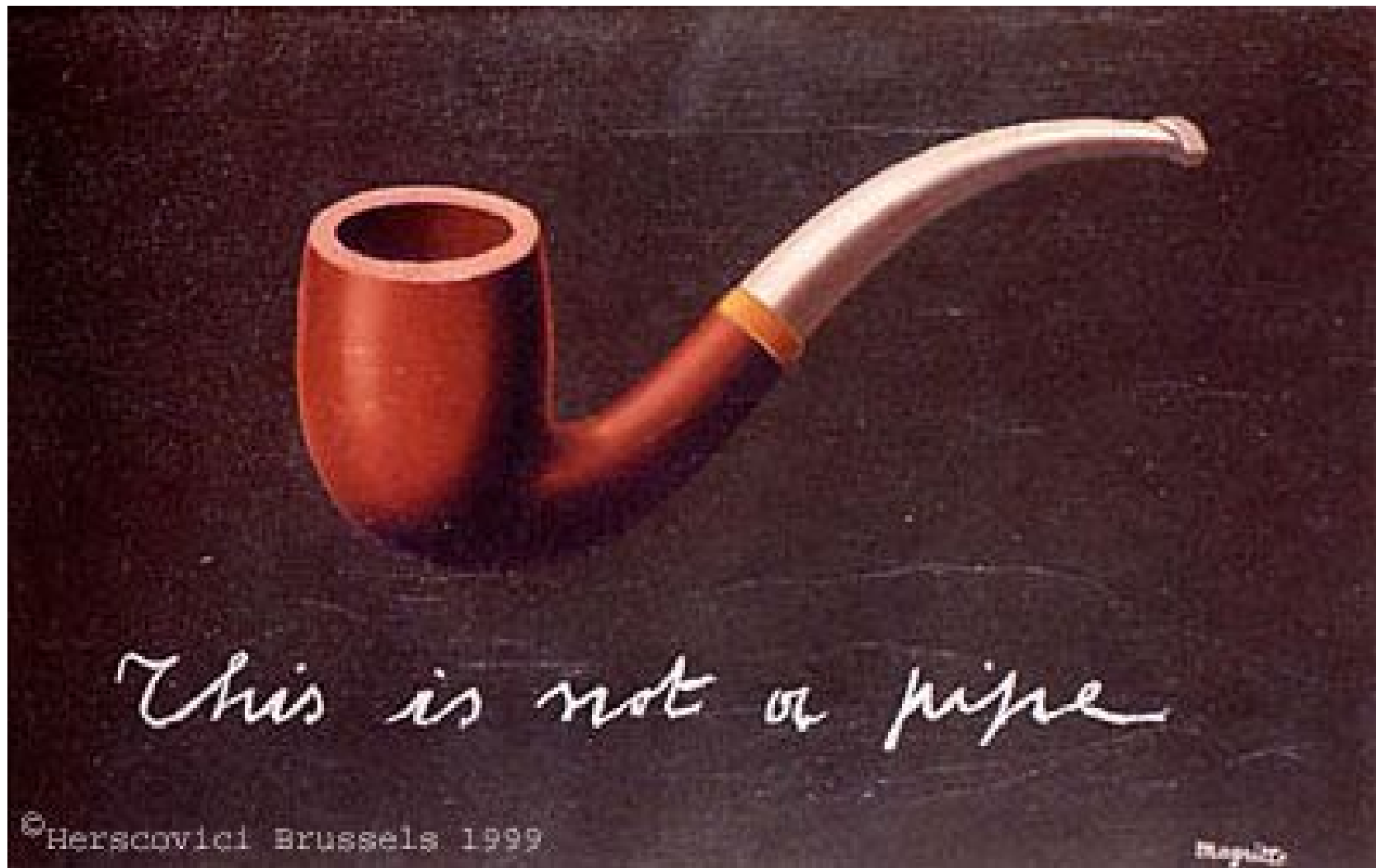
***Is child labor problem
serious in Korea?***

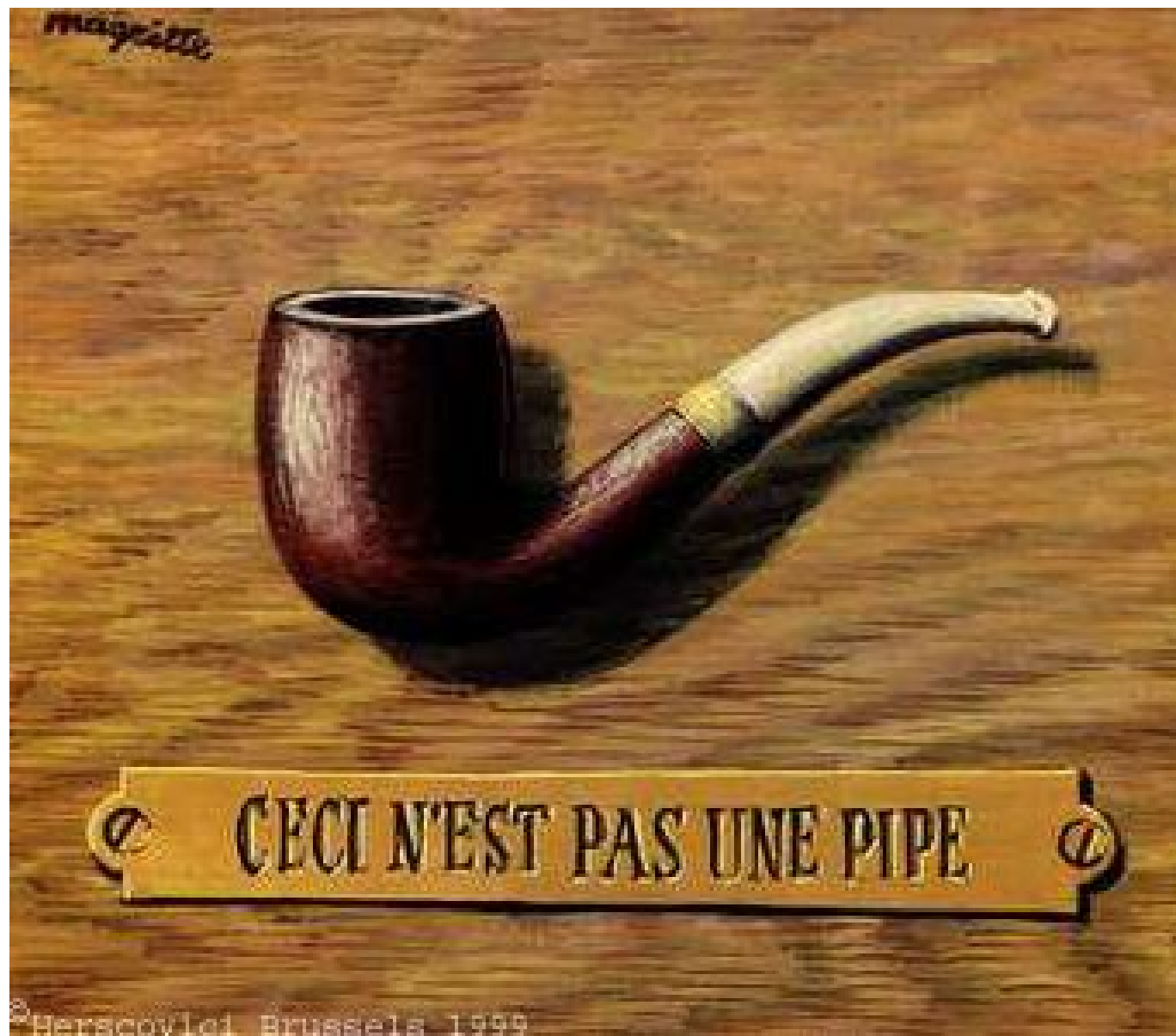
No ...

Ceci n'est pas une pipe.



Rene Magritte, 1898~1967





When was the tobacco introduced in your country?

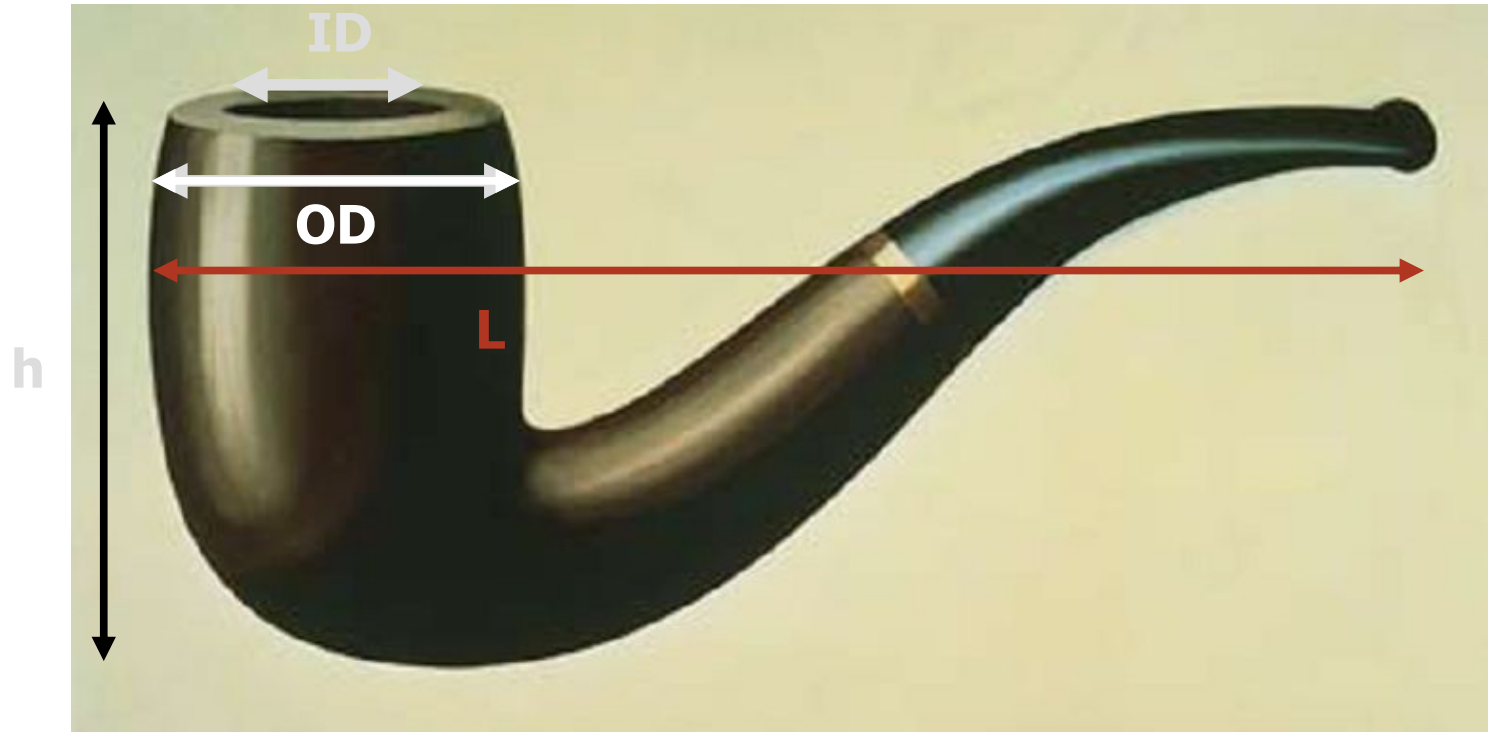
*Before the tobacco was known,
a pipe was shown and introduced.*

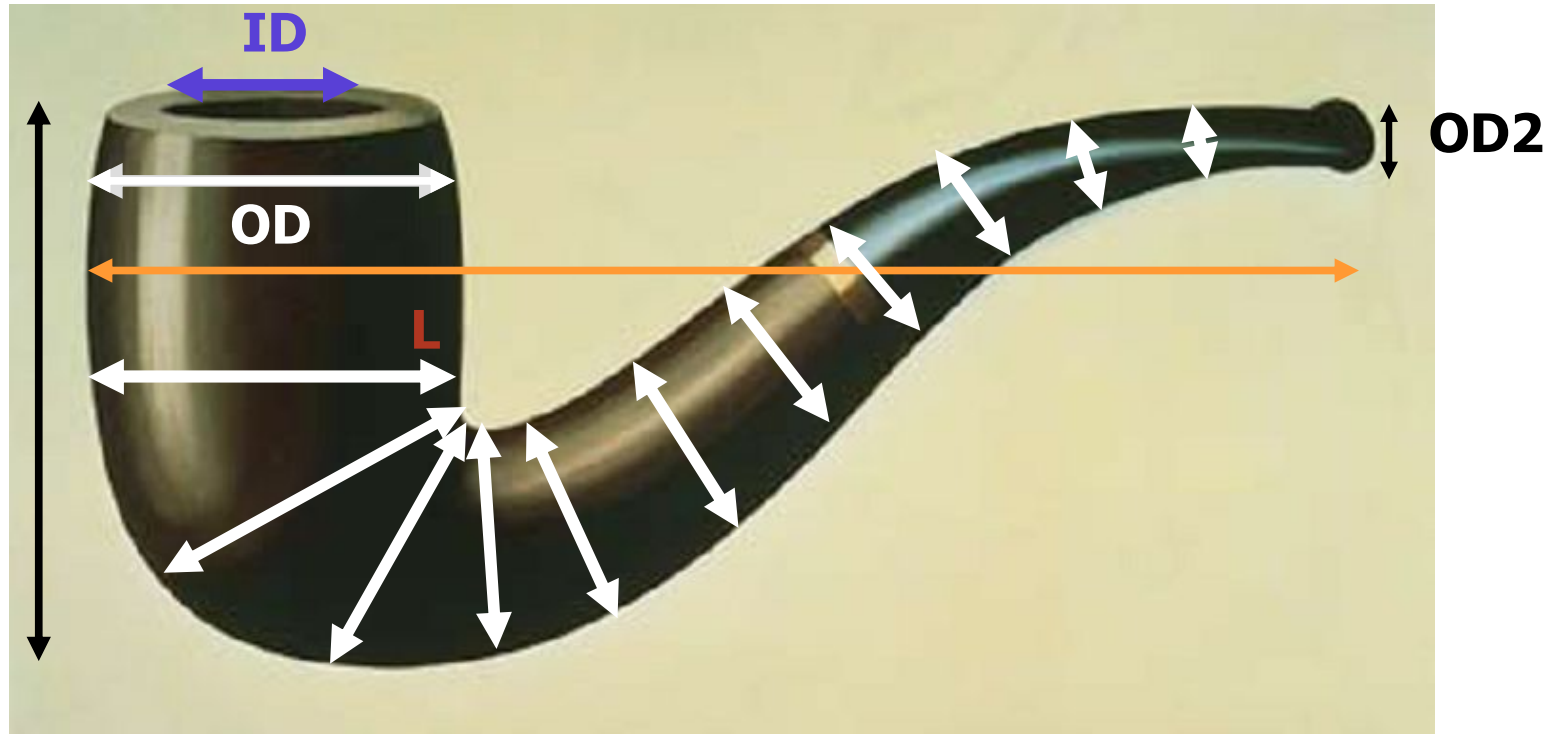


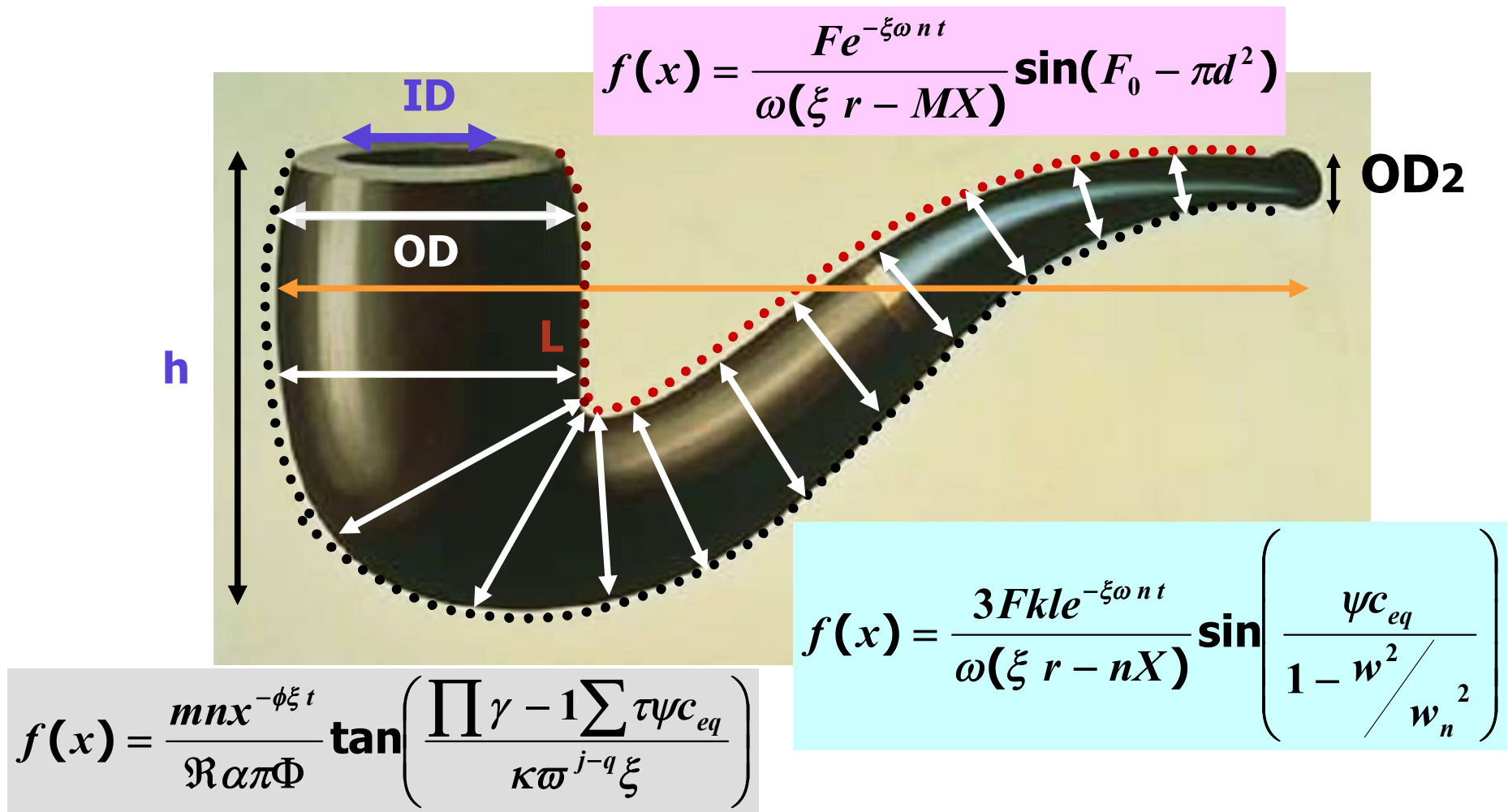
**When we face something new that
we have never experienced ,**

**we see it with our viewpoint, and
analyze it with the tools that we are
familiar with...**

This is intrinsic limitation!







Definition of Pipe

This is a pipe!

DESCRIPTIVE STATISTICS	
Number of samples (n)	10
Maximum (max)	190
Minimum (min)	33
Range	157
Percent above OEL (%>OEL)	100.000
Mean	87.400
Median	73.500
Standard deviation (s)	44.789
Mean of logtransformed data (LN)	4.362
Std. deviation of logtransformed data (LN)	0.489
Geometric mean (GM)	78.431
Geometric standard deviation (GSD)	1.631
TEST FOR DISTRIBUTION FIT	
W-test of logtransformed data (LN)	0.989
Lognormal (a = 0.05)?	Yes
W-test of data	0.897
Normal (a = 0.05)?	Yes
LOGNORMAL PARAMETRIC STATISTICS	
Estimated Arithmetic Mean - MVUE	87.257
LCL _{1,95%} - Land's "Exact"	67.950
UCL _{1,95%} - Land's "Exact"	125.930

Wall line (inside) 1

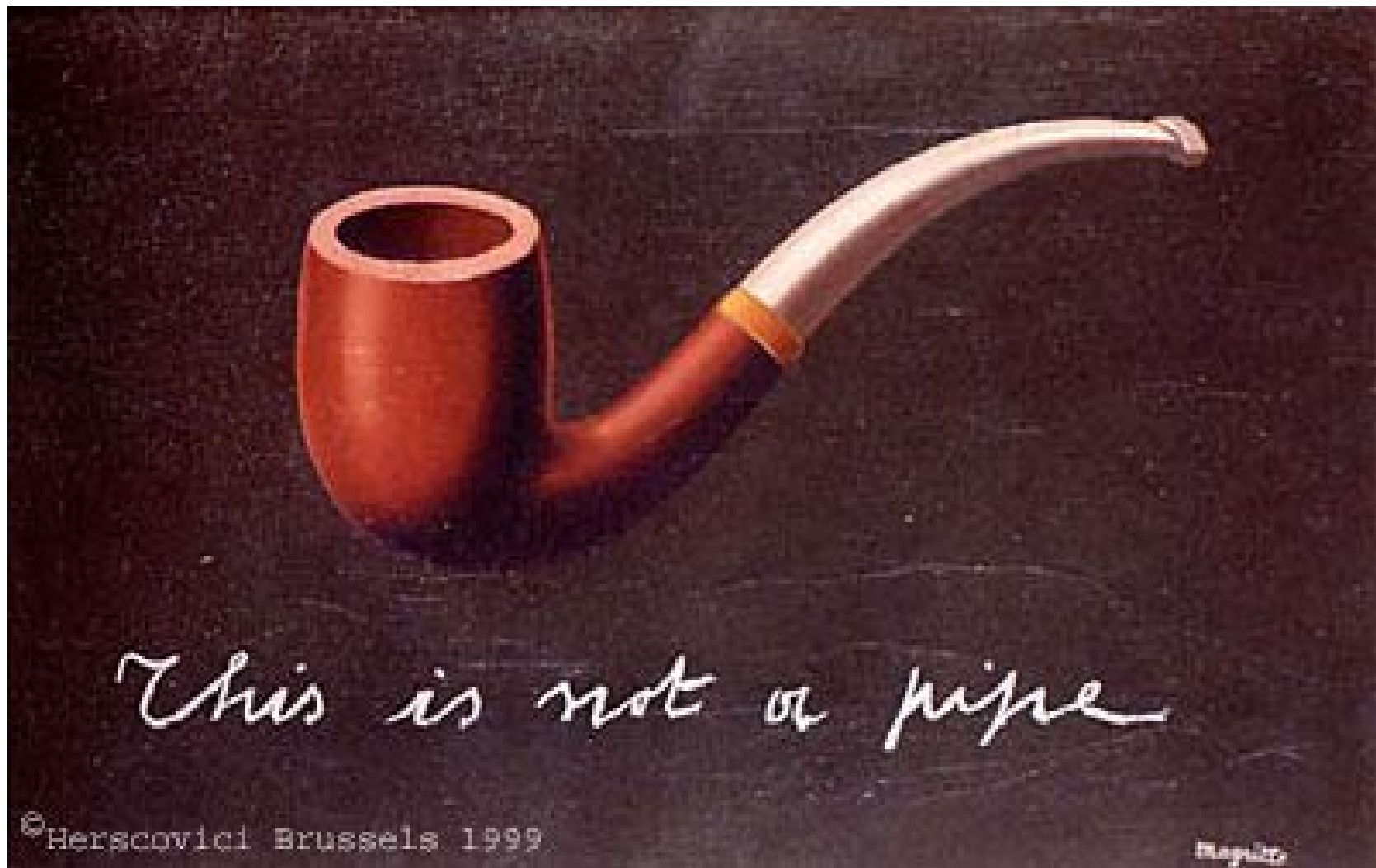
$$f(x) = \frac{Fe^{-\xi\omega n t}}{\omega(\xi r - MX)} \sin(F_0 - \pi d^2)$$

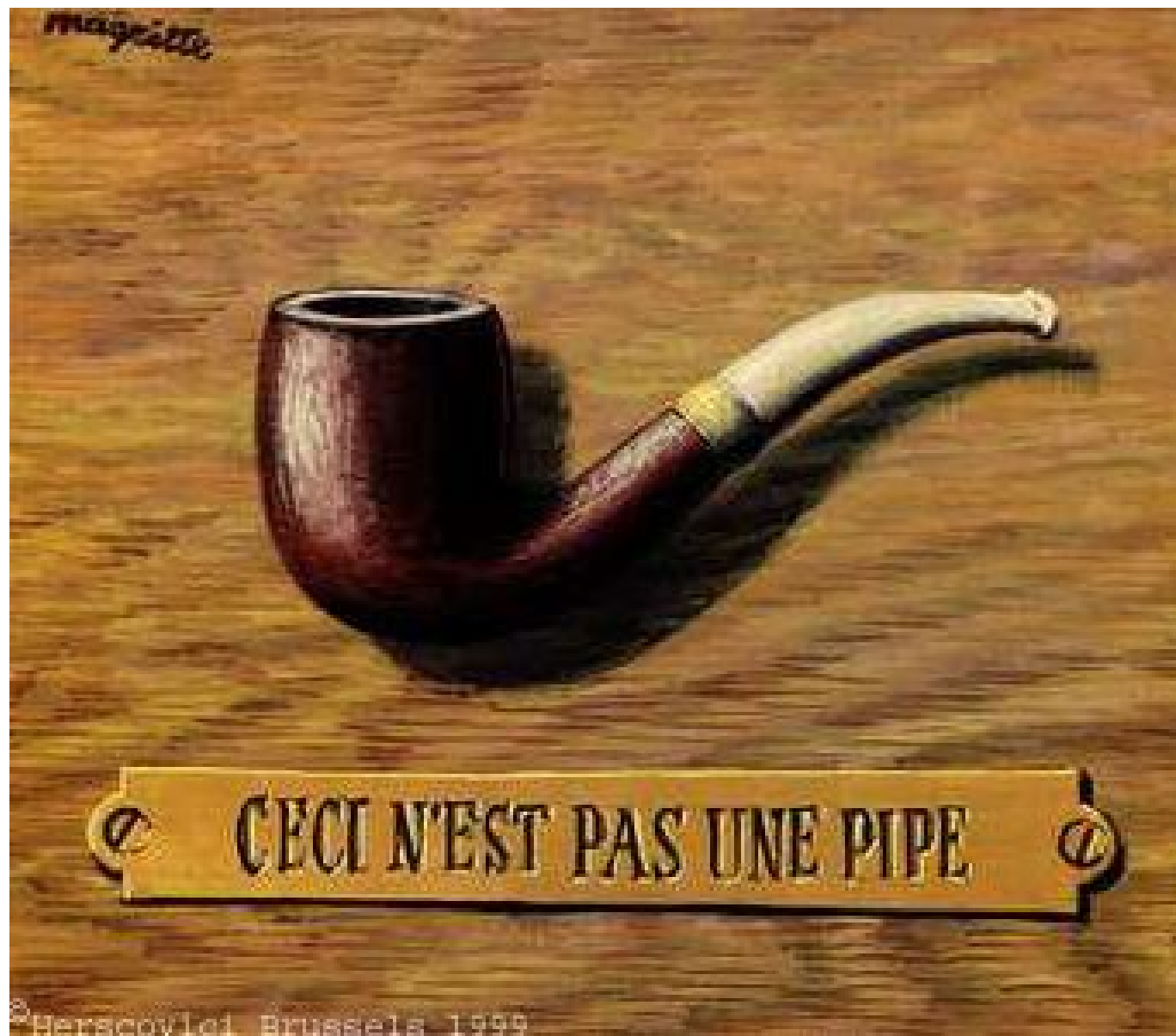
Wall line (outside) 2

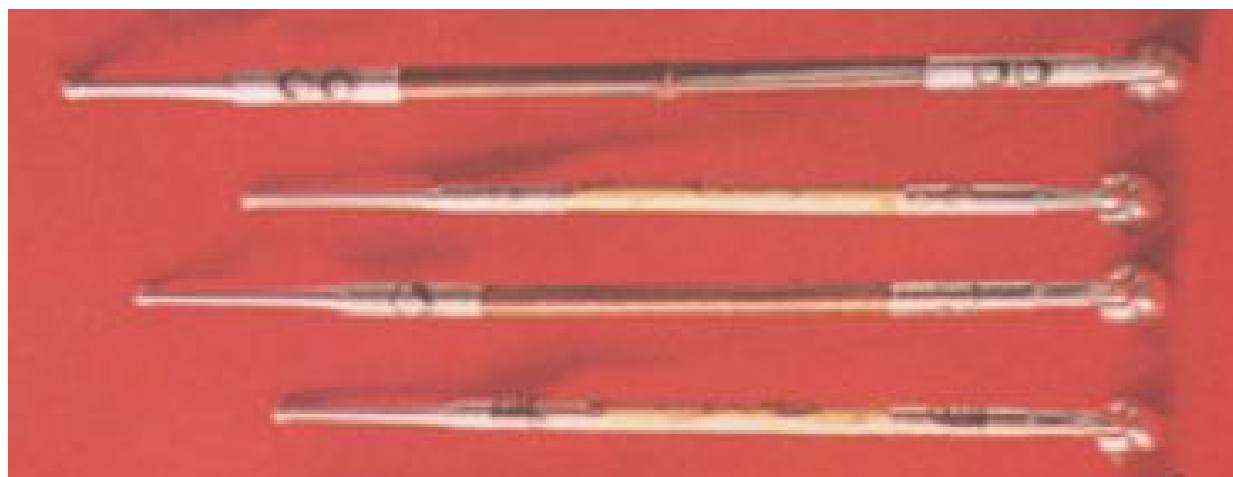
$$f(x) = \frac{3Fkle^{-\xi\omega n t}}{\omega(\xi r - nX)} \sin\left(\frac{\psi c_{eq}}{1 - \frac{w^2}{w_n^2}}\right)$$

Bottom line (outside) 1

$$f(x) = \frac{mnx^{-\phi\xi t}}{\Re\alpha\pi\Phi} \tan\left(\frac{\prod\gamma - 1 \sum\tau\psi c_{eq}}{\kappa\omega^{j-q}\xi}\right)$$







Risk and Risk Management

- 위험을 보는 관점
- 위험을 다루는 관점
- 위험에 개입하는 방법

무엇이 위험한 것이고 그 위험을 관리하기
위해서 무엇을 해야(하도록) 하는가?

A와 B사업장 중 어디가 더 위험한가?

A 사업장

벤젠농도

1.1 ppm

사업주가 문제를 잘 알고 있고, 교육도 잘 시키고 보호구도 잘 지급하고 있으며, 주기적으로 작업환경을 체크하고 있음.

B 사업장

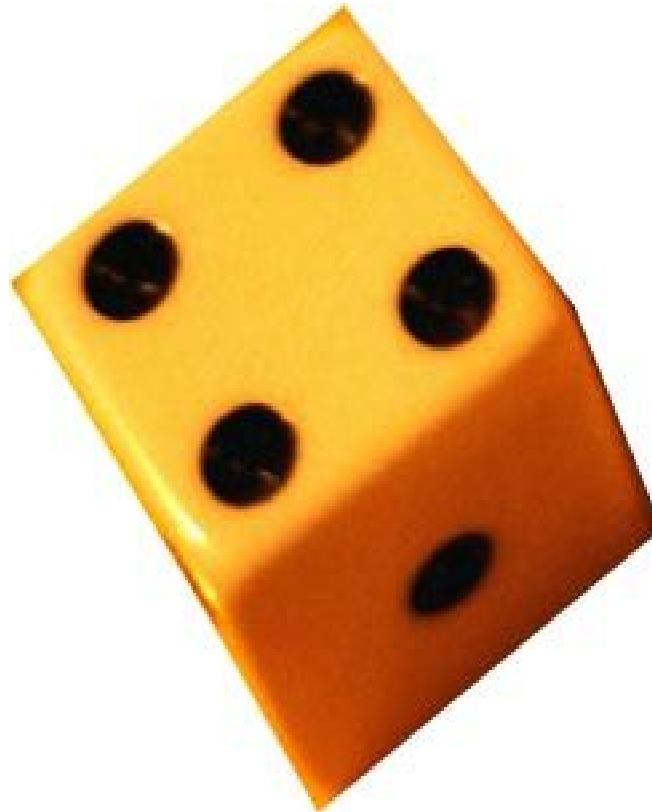
벤젠농도

0.9 ppm

사업주는 벤젠이 문제가 유해하다는 것도 모르고 있으며 관심도 없음. 산업안전감독을 나가면 보건관리대행기관에서 와서 답변.

What is RISK?

유해/위험요인
Hazard



Al zahr

Etymology of Risk

South Europe: *risicare*
→ *to dare*



Safety Management Aspect

What is Risk?

1. Unknown Status
=Uncertainty

Safety Management Aspect

What is Risk Management?

1. Unknown Status
→ **Known Status**
→ **Certainty ↑**

Monitoring, checking!

Safety Management Aspect

What is Risk?

2. Known Status ≠ Reality

Company: <u>ABC Company</u>		AREA AUDITED AND RESULTS										
Location: <u>Anywhere, USA</u>												
Date: <u>1/20 - 21/97</u>		Offices	Shipping/Receiving	Manufacturing	Test/QC	Storage						TOTAL
Type of Audit: <u>Registration Audit</u>												
ISO Standard: <u></u>												
ISO Clause	Clause Description:											
4.1	Management Responsibility	ok	ok	ok	ok	ok						
4.2	Quality System	ok	ok	ok	ok	ok						
4.3	Contract Review	ok	ok	N	N	N						
4.4	Design Control	ok	N	N	N	N						
4.5	Document and Data Control	ok	ok	ok	ok	ok						
4.6	Purchasing	ok	N	N	N	N						
4.7	Control of Customer Supplied Product	ok	N	N	N	N						
4.8	Product Identification and Traceability	N	A	ok	ok	ok						
4.9	Process Control	N	N	A	A	A						
4.10	Inspection and Testing	N	ok	A	A	N						

Safety Management Aspect

What is Risk Management?

**2. Known Status
= Reality**

Checking, Auditing

작위범죄와 부작위범죄

作為犯 vs 不作為犯

행위를 하여

**살인
강도
절도**

**형사처벌을
강하게 하는 경향**

행위를 하지 아니하여

**전통적
산업안전보건**

**형사처벌을 가하지
않는 경향성**

作為犯 vs 不作為犯

행위를 하여

**살인
강도
절도**

**형사처벌을
강하게 하는 경향**

**자율관리
노사참여와 협력**

행위를 하지 아니하여

**전통적
산업안전보건**

**형사처벌을 가하지
않는 경향성**

**직접규제방식
전문가중심**

作為犯 vs 不作為犯

행위를 하여

살인
강도
절도

행위를 하지 아니하여

전통적
산업안전보건

근골격계 질환문제

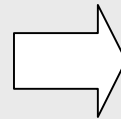
정신적 부담요인

노사가 객체에서 주체로의 전환

과거 → 현재 → 미래

물리, 화학, 생물학적 요인

객관적
과학적
기술적



근골격계, 스트레스요인

주관적
심리적
관계적

주체: 전문가, 정부

사업주, 근로자 → 객체

주체: 사업주, 근로자

전문가, 정부 → 객체

규제의 한계

산업안전보건 규제체계 측면에서의 분석



일반적 행정규제, 정부규제



“강제 집행”

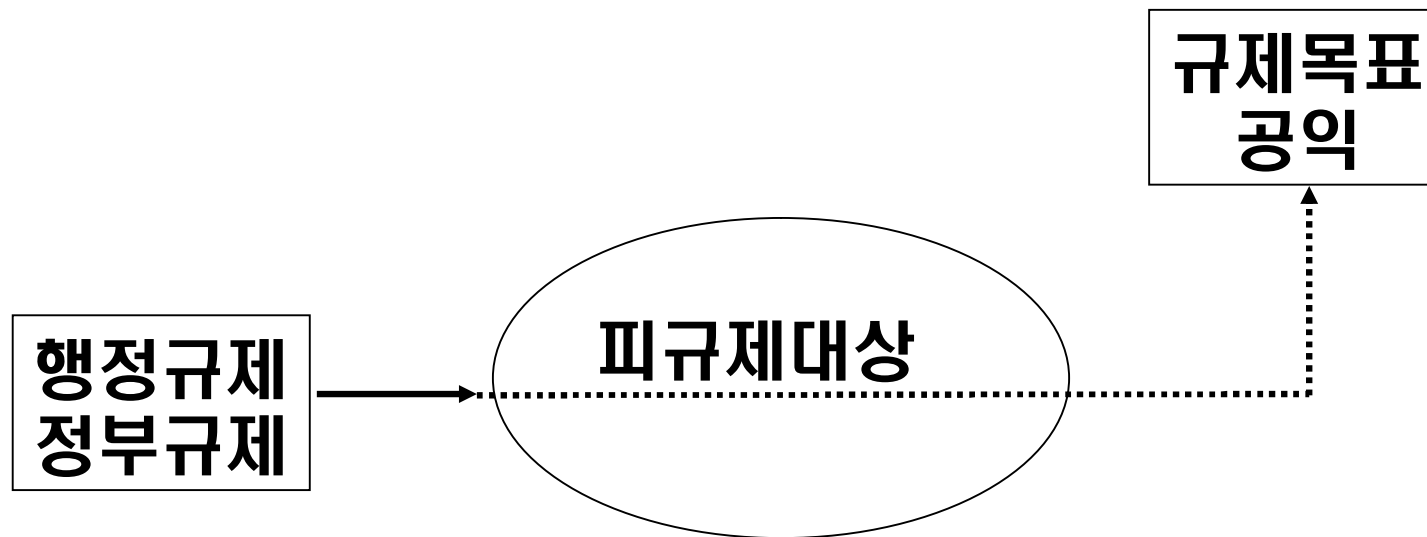
불법광고판 강제철거



노점상 단속



일반적 행정규제, 정부규제



“강제 집행”

산업안전보건 규제



~~“강제 집행”~~





산업안전보건규제의 특징

“이중 구조적”



반드시 “사업주”를 통하여
반드시 “사업장”을 통하여

직접규제의 한계

“Command-control regulations”의 한계



〈 산업안전보건규제의 이론적 모델 〉

“이론적”



“일반적”



“한계”



산업안전보건 = 대관업무

규제의 불합리성 → 규제완화 요구

법적 권리 개념

4 대 법적 권리

- 자유권
- 권한권
- 청구권
- 면제권

4 대 법적 권리

- 자유권
- 권한권
- 청구권
- 면제권의 부여/제한, 삭제

처벌의 3대 기준

- 비난 가능성(의도/인과관계)
 - 책임역량
 - 결과의 크기

외국에서의 위험성 평가제도

영국 1972 로벤스 보고서

영국 1974 HSAW

EU 89/391 OSH Directive

1990년대 중반 유럽각국

2006. 4 일본 노동안전위생법

Risk Assessment

영국 HSE에서 시행하고 있는 사항

Purpose of Risk Assessment in Workplace

The primary responsibility of occupational safety and health at workplaces should lie with

- **those who create the risks and**
- **those who work with them**

UK 법적 기초

'so far as is reasonably practicable'

~~모든 리스크 제거/감소~~

Risk : time, trouble, cost

UK 법에서 요구하는 것

**Good management
Common sense**

**Look at → What the risks are!
Look at → How to handle!**

The Management of Health and Safety at Work Regulations 1999 (Management Regulations 1999)

The main requirement on employers is to carry out a risk assessment. Employers with five or more employees need to record the significant findings of the risk assessment.

Risk Assessment

Simple in a simple workplace (office, SMEs)
Complicated in a serious hazard workplace
(chemical plant, oil industry)

The HSE leaflet *Five steps to risk assessment* will give you more information.

Risk Assessment +

- RA에서 드러난 위험요인에 대해 안전보건 조치 실행을 위한 조치
- 안전보건조치를 실행할 적절한 담당자(책임자) 지명
- 비상계획을 수립
- 정확한 정보제공, 근로자 훈련
- 같은 작업장 공유하는 타 사업주와 공동보조

영국의 Enforcement

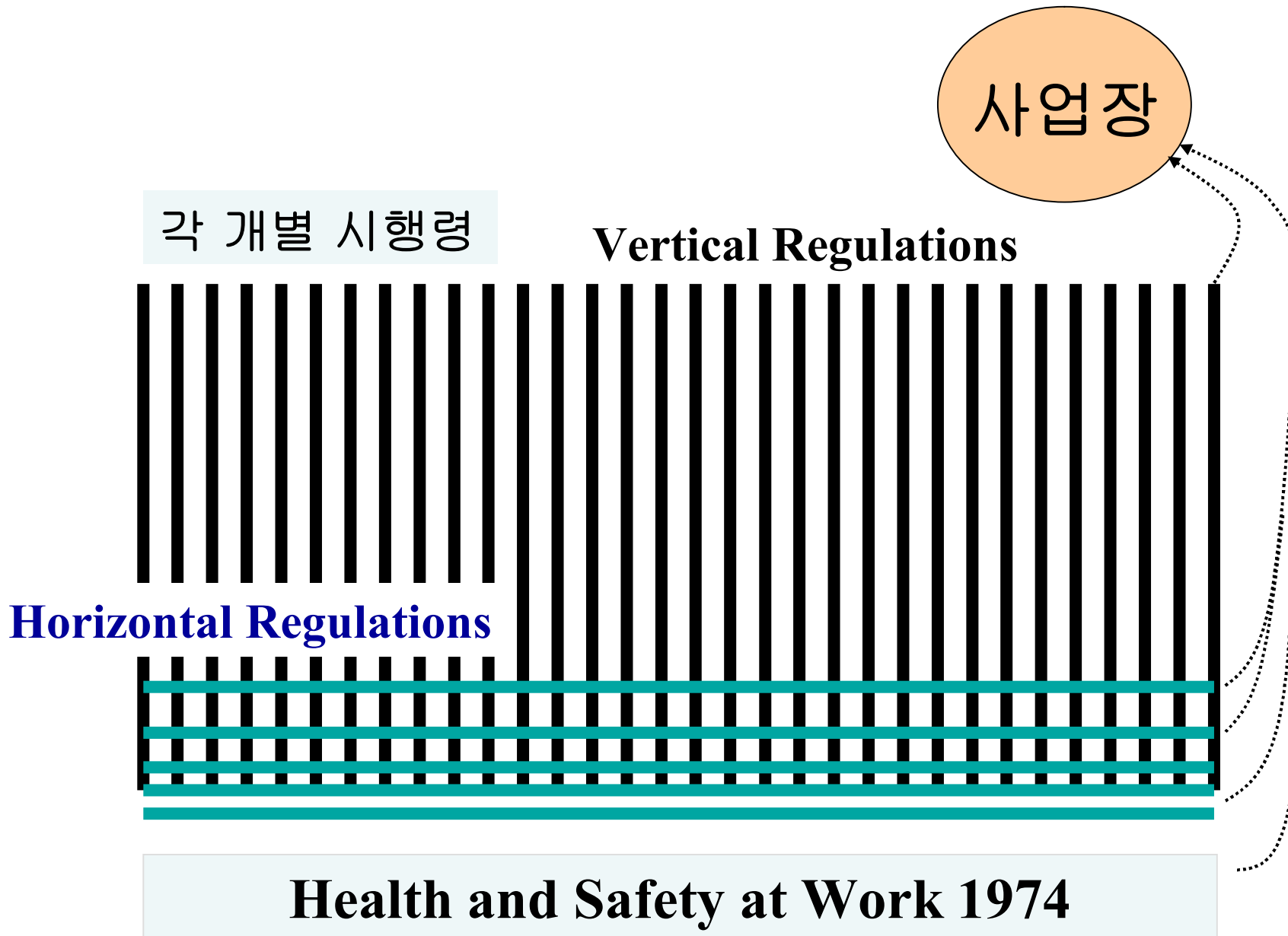
HSE's Enforcement Policy

- 1. Give advice on how to comply with the law.**
- 2. Order improvement**
- 3. Prosecute**

UK HSE Regulations

1. Abrasive Wheel Regulations 1970
2. Acetylene Import 1978
3. Acetylene In Admixture Oil Gas 5
Acetylene In Admixture Oil Gas 5A
4. Acetylene In Porous Substance 9
5. Acetylene Order
6. Acetylene Prohib Manufacture 30
7. Adventure Activities EA & licensing
Amen
8. Adventure Activities Lic Des
Adventure Activities Licensing 1996
9. Ag (Children)
10. Ag (Thresh/Bale)
11. Ag Children
12. Ag Circular Saws
13. AG Field Machinery
14. Ag Ladders
15. Ag Pois Subs mod 1975
16. Ag Poisonous Substances Ext 1960
AG Poisonous Substances Ext 1965
AG Poisonous Substances Ext 1966
17. Ag Power Take-Off
18. Ag Safeguarding Of Workplaces
19. Ag Stationary Machinery
20. Ag Tractor Cab
21. Ag Welfare Provisions
22. Agriculture Metricrication
23. Agriculture Power Take-Off A
24. Agriculture Tractor Cab Mod
25. Air Pollution
26. Ammonium Nitrate Exemption
27. Anthrax Prevention
Anthrax Prevention Exemptions
Anthrax Prevention Mod
28. Appoint Of Factory Inspector
29. Asbestos (Licensing) Regs 1983
30. Asbestos (Prohibitions) 1992
31. Asbestos In Air Regs1990
32. Borehole Sites And Operations
33. Breathing Apperatus Exam

- 383. Slaughtehouse 2
- 384. Slaughtehouse 1
- 385. Spinning by Mules
- 386. Submarine Pipeline (Exemption)
 - Submarine Pipeline (Inspectors) Amend
 - Submarine Pipelines 1982
 - Submarine Pipelines A
 - Submarine Pipelines Inspectors
- 387. Supply M/C Amendment
- 388. Supply of Machinery (Safety) 1992
- 389. TDG (Safety Advisers) Regulations 1999
- 390. TPVR 2001
- 391. Trans + Works Appl (Inland Water) 1993
- 392. Underground Rooms
- 393. Unfenced M/CA
 - Unfenced M/C
 - Unfenced M/C AS
- 394. Vireous Enamelling Metal Glass
- 395. Visiting Forces
- 396. Woodwork 1974
- 397. Work In Compressed Air 1996
- 398. Work Time Regs 1998
- 399. Working Time 99
- 400. Workplace Regs 1992





Enforcement policy statement

Health & Safety
Commission

HSE Prosecutions Area : Case Details - Microsoft Internet Explorer

파일(F) 편집(E) 보기(V) 즐겨찾기(A) 도구(T) 도움말(H)

뒤로 앞으로 검색 즐겨찾기 미디어

주소(D) http://www.hse-databases.co.uk/prosecutions/case/case_details.asp? 이동 연결 » TAKE1

home documents feedback help
search advanced geographical industry

Details for Case No. F060000280

Defendant [1st Saxon Property Services](#)

Summary HSW'74, S3(1), Construction (H,S & W) Reg.96, Reg 9(1) & MHSW Reg.'99 Reg 3 (1)(b). Self-employed window fitter was killed whilst replacing bay window. The unpropped bay window roof slab collapsed on him. Main reason for prosecution was lack of RA into the safety aspects of the window replacing activity.

This case did result from the investigation of a fatality

Offence Date 15/11/1999

Total Fine £5,000.00 **Total Costs Awarded to HSE** £6,514.73

[Breach involved in this Case](#)

Location of Offence

Address	10 Normandy Way ERITH Kent	Region	LONDON
		Local Authority	Bexlev

**HSW'74, S3(1), Construction (H,S & W) Reg.96,
Reg 9(1) & MHSW Reg.'99 Reg 3(1)(b).**

**Self-employed window fitter was killed whilst
replacing bay window. The unpropred bay
window roof slab collapsed on him. **Main
reason for prosecution was lack of RA** into the
safety aspects of the window replacing activity.**

**This case did result from the investigation of a
fatality.**

HSE Prosecutions Area : Case Details - Microsoft Internet Explorer

파일(F) 편집(E) 보기(V) 즐겨찾기(A) 도구(T) 도움말(H)

뒤로 앞으로 검색 즐겨찾기 미디어

주소(D) http://www.hse-databases.co.uk/prosecutions/case/case_details.asp? 이동 연결 » NTake

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Details for Case No. F020000218

Defendant [2HO Ltd](#)

Summary Prosecution followed an accident to two employees who were burnt when flammable solvent fumes were ignited by an electric sander whilst removing paint from inside a confined space in a small yacht under repair. Case taken because of the failure to: a) carry out risk assessment for entry into a confined space, b) provide a safe system of work for cleaning paint in the confined space, c) select suitable work equipment for use in a flammable atmosphere in a confined space, and d) ensure the safety of employees working in the confined space. High potential for serious injury working in confined space with flammable solvents.

Offence Date 04/02/1999

Total Fine £2,500.00 **Total Costs Awarded to HSE** £648.62

[Breaches involved in this Case](#)

Location of Offence

Address	Region
Hamble Point	SOUTH EAST

Prosecution followed an accident to two employees who were burnt when flammable solvent fumes were ignited by an electric sander whilst removing paint from inside a confined space in a small yacht under repair. Case taken because of the failure to: a) carry out risk assessment for entry into a confined space, b) provide a safe system of work for cleaning paint in the confined space, c) select suitable work equipment for use in a flammable atmosphere in a confined space, and d) ensure the safety of employees working in the confined space. High potential for serious injury working in confined space with flammable solvents.

- 위험을 보는 관점
- 위험을 다루는 관점
- 위험에 개입하는 방법

무엇이 위험한 것이고 그 위험을 관리하기
위해서 무엇을 해야(하도록) 하는가?

A와 B사업장 중 어디가 더 위험한가?

A 사업장

벤젠농도

1.1 ppm

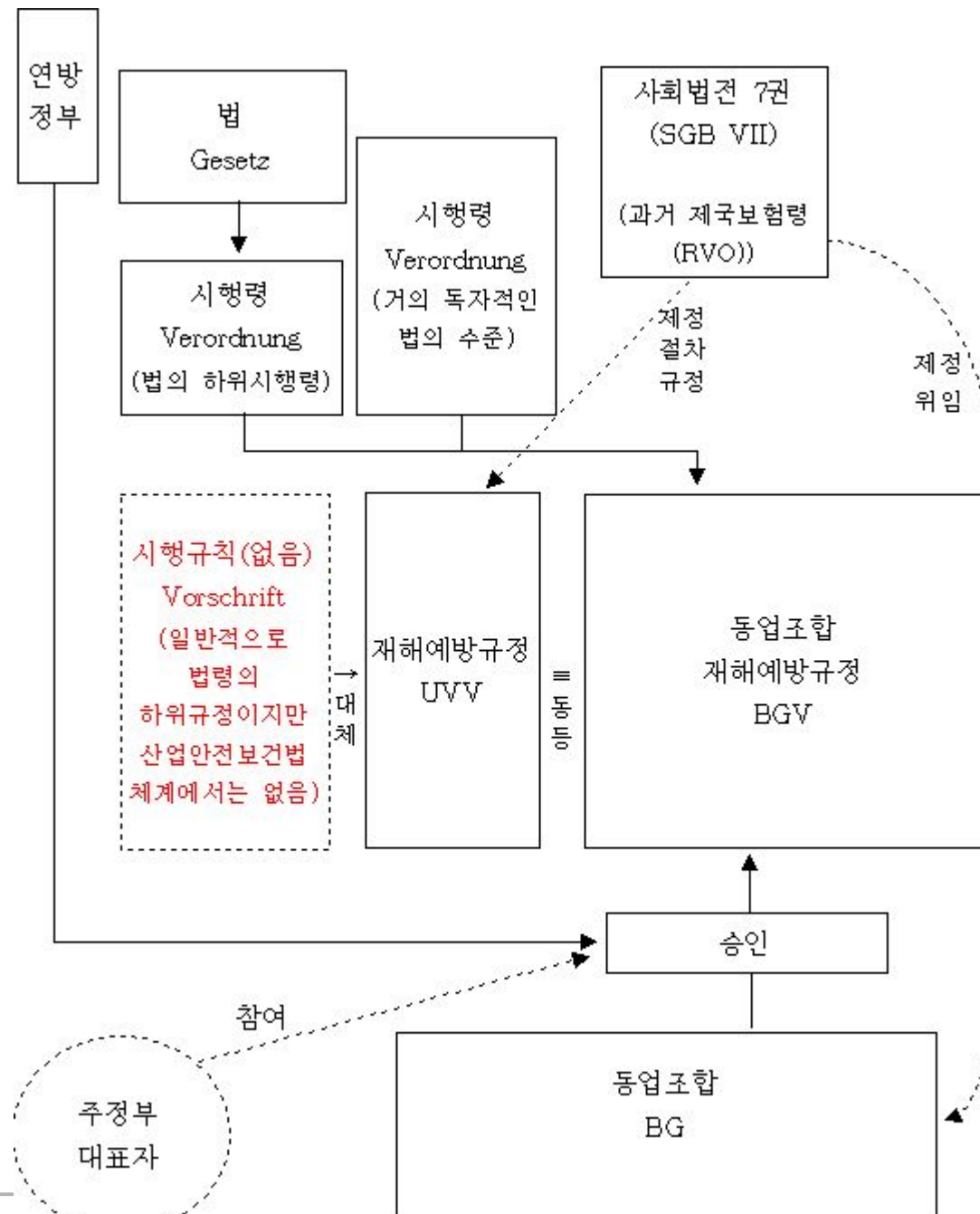
사업주가 문제를 잘 알고 있고, 교육도 잘 시키고 보호구도 잘 지급하고 있으며, 주기적으로 작업환경을 체크하고 있음.

B 사업장

벤젠농도

0.9 ppm

사업주는 벤젠이 문제가 유해하다는 것도 모르고 있으며 관심도 없음. 산업안전감독을 나가면 보건관리대행기관에서 와서 답변.



구분	유럽지침	독일법령
기본지침	EG의 산업안전지침 89/391/EWG*	사업장안전보건조치법 (ArbSchG, 1996)
시행령	89/656/EWG PSA use	PSA-BV(1996.12.20) 보호구사용시행령
	89/655/EWG Worktool use	AMBV(1997.3.11) 작업기구사용시행령
	90/270/EWG VDT work	BildscharbV(1996.12.4) VDT작업시행령)
	90/269/EWG Manual Material Handling	LasthandhabV(1996.12.4) 중량물취급시행령
	89/654/EWG Workplaces	ArbStättV(1996.12.4 개정) 작업장소안전시행령

2006. 4 일본 노동안전위생법 개정

**사업주의 위험성 평가의무
[노력의무]**

결론

FAQ

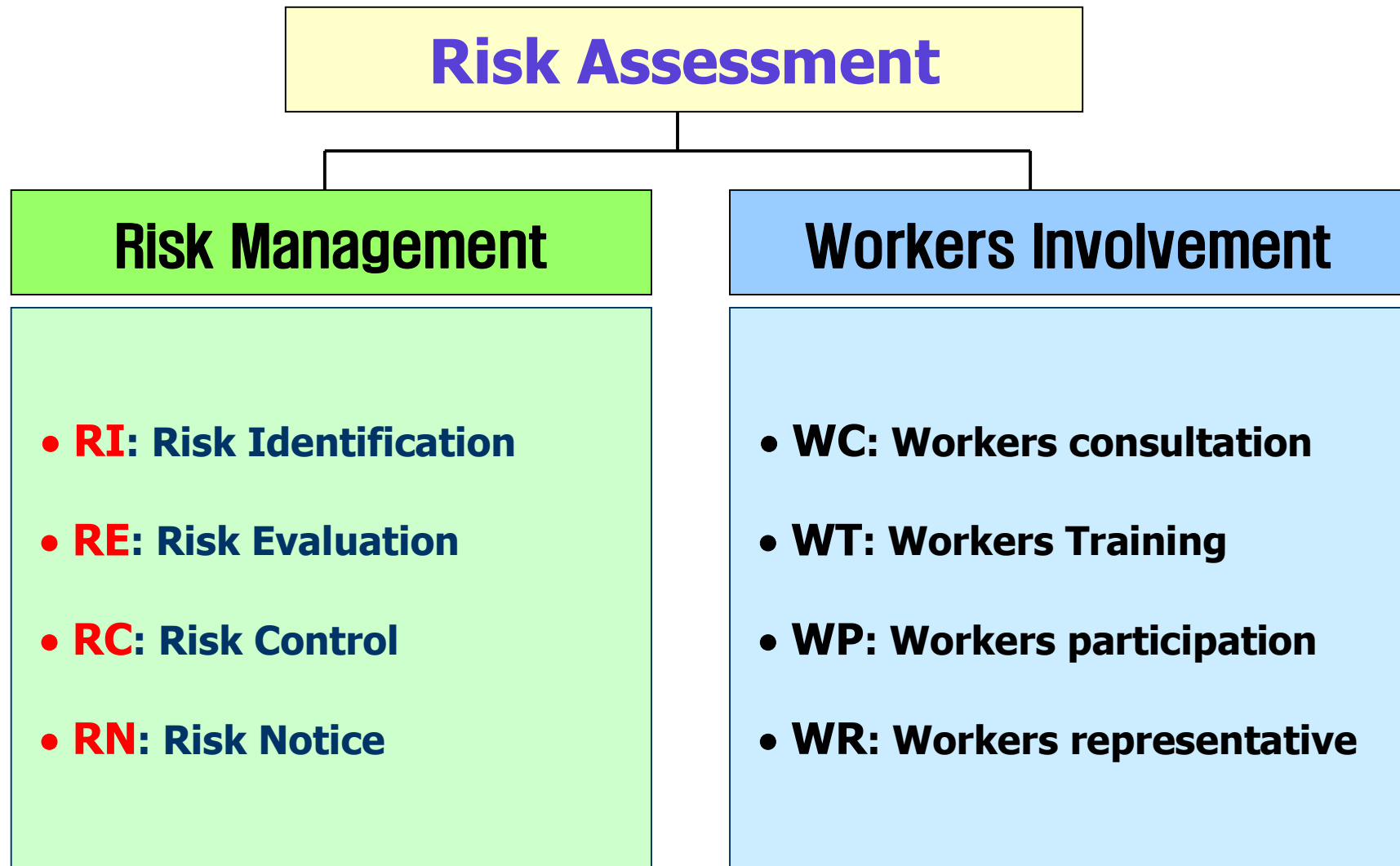
1. Risk Assessment는 누가 실시합니까?
2. 너무 간단한 거 아닙니까?
3. 제대로 평가가 가능하겠습니까?

1. Risk Assessment는 누가 실시합니까?

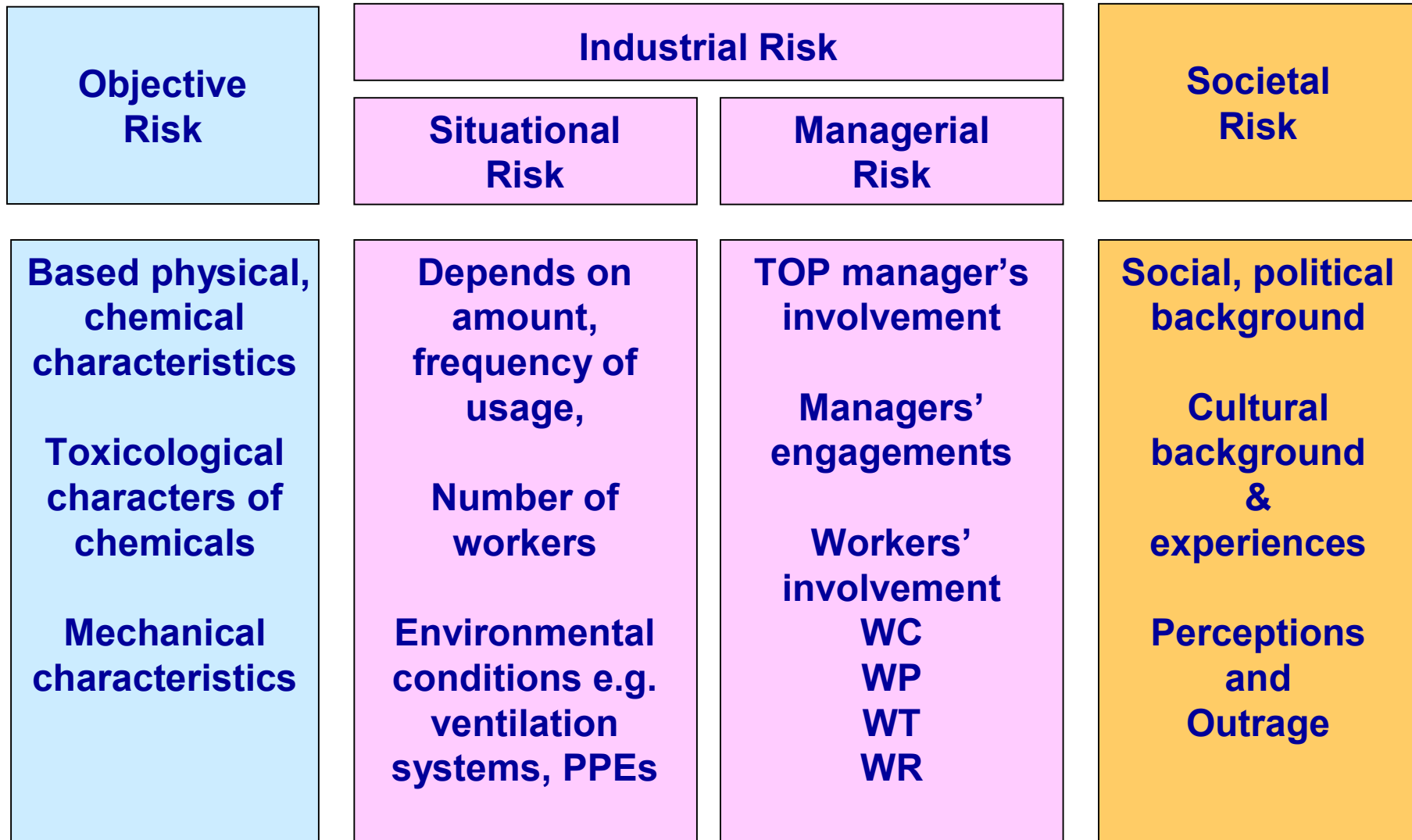
기본적으로

- **Those who create them**
- **Those who work with them**

Risk Assessment (4R+4W, dooyong's version)



Risk Spectrum



2. 너무 간단한 거 아닙니까?

- Yes, it should be...

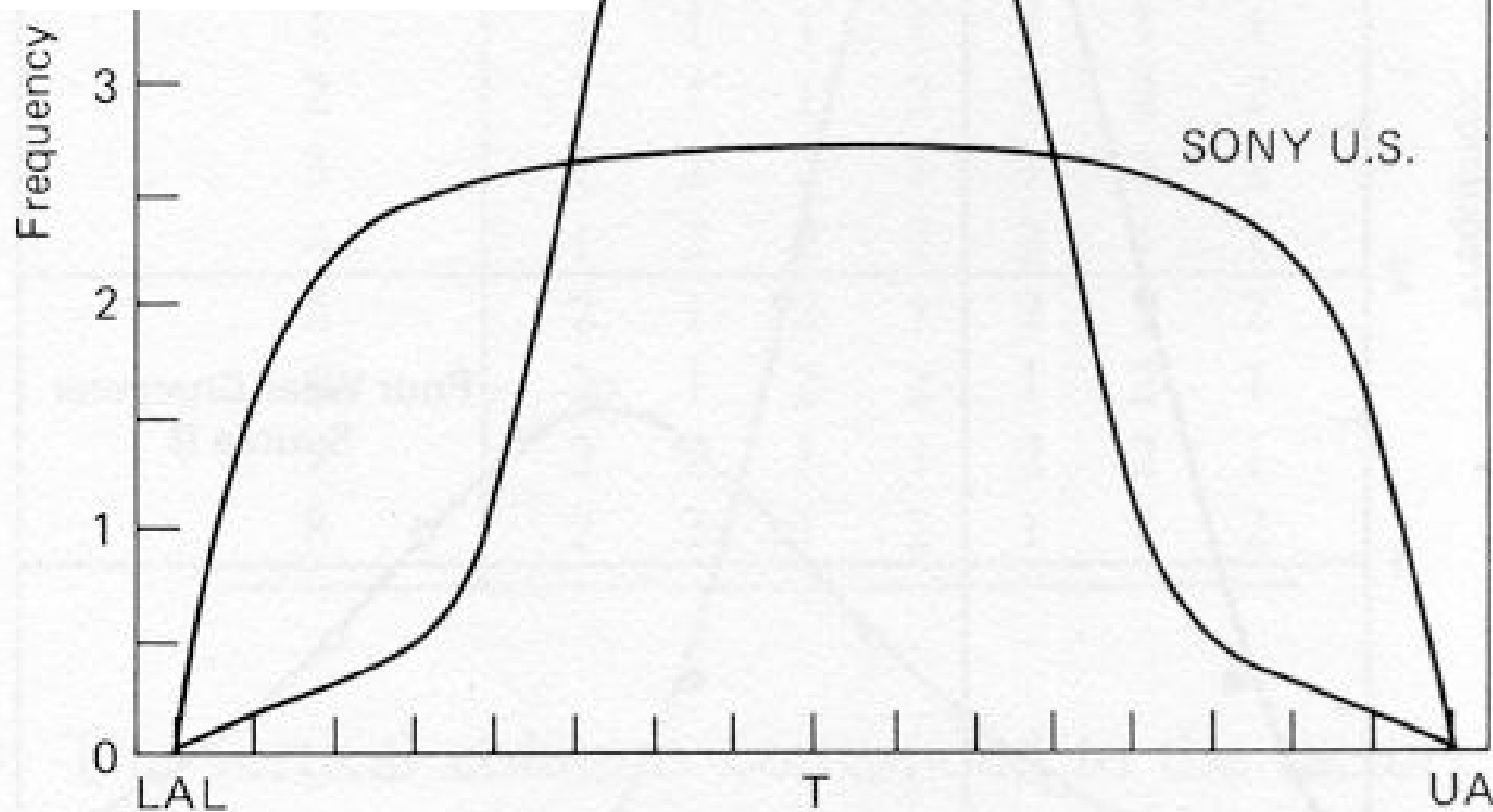
Think about who run this process

3. 제대로 평가가 되겠습니까?

- This is the point!!!

Often, it is the
variance, not the
target, that
determines quality!

(Taguchi Method. R. Roy.
Van Nostrand. P. 13)



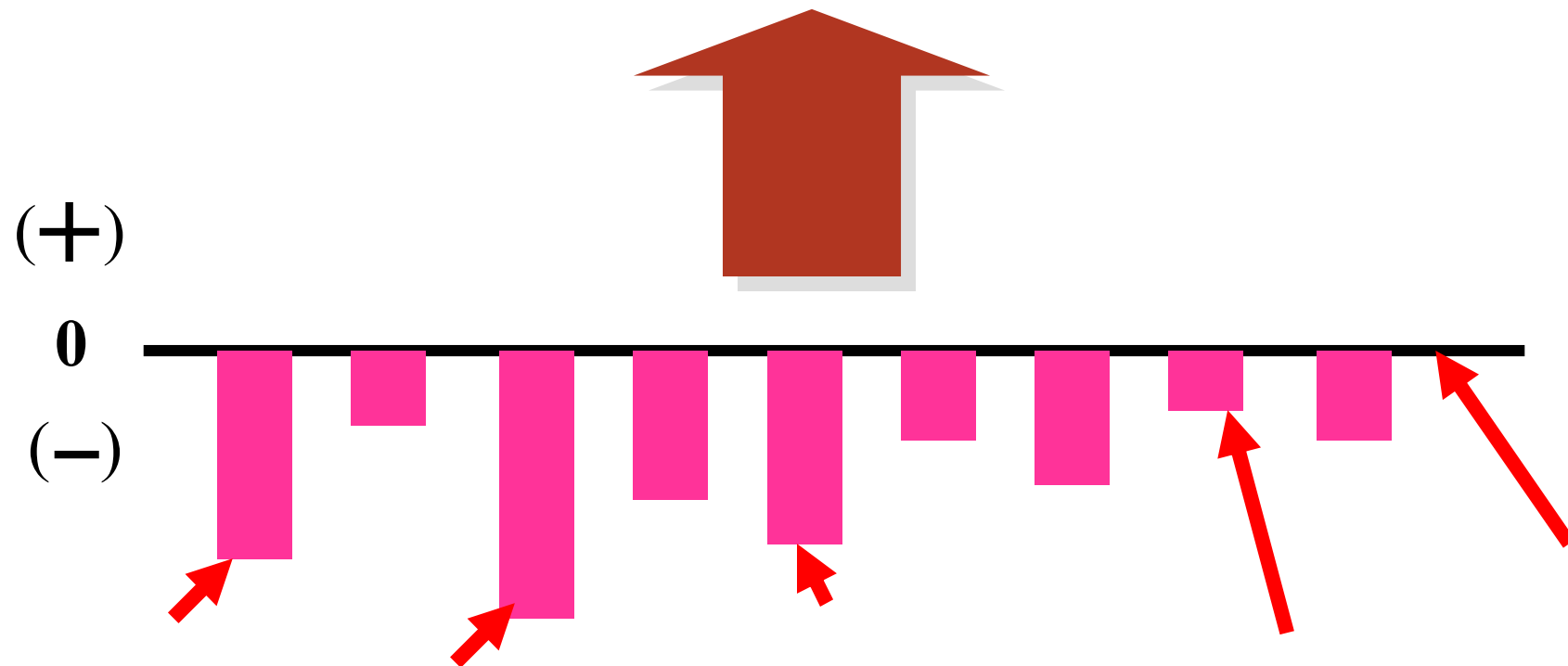
Control 개선(改善)

Continuous Improvement

1. 잘못된 것으로 바로잡는 것
2. 특별히 잘못된 것이 없더라도 더 좋게 하는 것

개선

- 특별히 잘못된 것이 없더라도 더 좋게 하는 것



- 잘못된 것으로 바로잡는 것

3. 제대로 평가가 되겠습니까?

- **Priority setting**
- **Awareness**
- **Self management**
- **Continual improvement**

Risk Assessment (4R+4W)

