

## **Machinery Model Examination Survey in Taiwan**

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## **Machinery Model Examination Survey in Taiwan**

- Policy of safety and health
- Plans of preventing mechanical accident
- Machinery model examination
- Conclusion

## **Policy of safety and health**

Council of Labor Affairs, Executive Yuan, Taiwan

- Ensuring the labor safety in an all-around way
- Building a safe work environment

## **Basic Conception of Occupational Safety**

- Priceless life nothing could be exchanged and replaced
- Learning the protection to avoid (reduce) the danger in the workplace.
- Less occupational injury, Less family tragedy.

## **Case Study 1 Occupational Accident**

- 100% Family manpower loss VS  
0.1% factory manpower loss.

## **Case Study 2 Occupational Accident**

- Great Mother  
70%-80% burn on her body for explosion, on the way to hospital, only care and concern her son's diet.

## Case Study 3 Occupational Accident

- Life going on  
Young man still earn money to support family economy although two hands are handicapped.

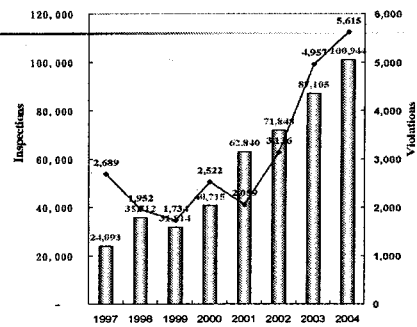
## Strategy for safety and health

- If you are determined to do, you can do it well.
- There must be some way to do better than now.
- Orientation for disaster prevention, organization reengineering, inspection efficiency and social mobilization.
- CLA has worked out the mid-term strategy of labor safety and health for reducing occupational death.

## Goals of safety and health

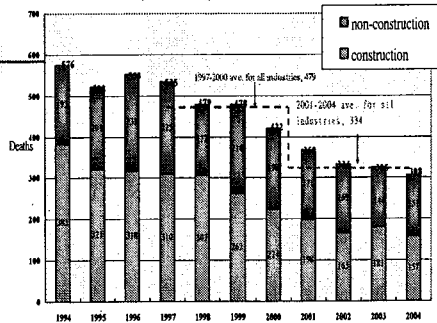
- Reducing the occupational death to 40% in 4 years (2001-2004).
  - 2001:15% ↓
  - 2002:15% ↓
  - 2003:5 % ↓
  - 2004:5 % ↓

## Number of Safety Inspections and Violations



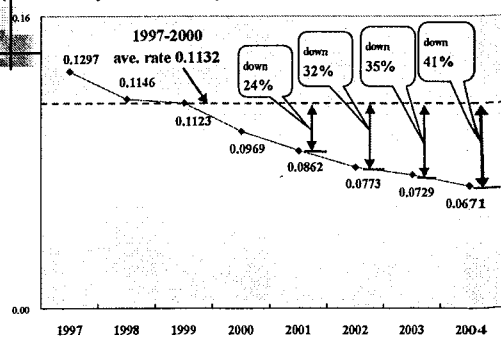
Source: Department of Labor Inspection, Taiwan Council of Labor Affairs (CLA)

## Deaths caused by occupational accidents in Taiwan



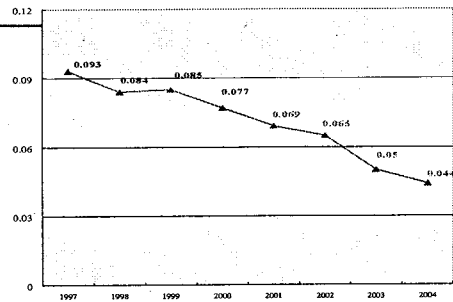
Note: Deaths only covered by Labor Safety and Health Law (4,600,000 workers)  
Source: Department of Labor Inspection, Taiwan Council of Labor Affairs (CLA)

## Rate of Occupational Deaths Per Thousand Workers in Taiwan (Covered by Labor Safety and Health Law: 4,600,000 workers)



Source: Department of Labor Inspection, Council of Labor Affairs (CLA), Taiwan

**Rate of Occupational Deaths Per Thousand Insured Workers in Taiwan (8,070,000 workers)**

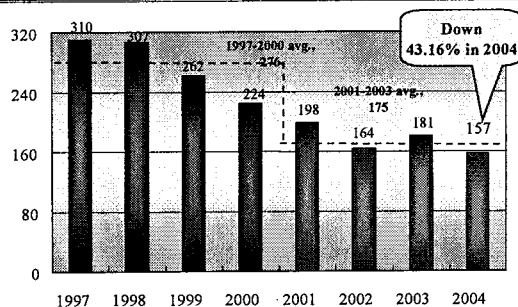


Source: Bureau of Labor Insurance, Taiwan Council of Labor Affairs (CLA)

## Results of efforts of 4 years

- Strengthen safety and health supervision and inspection of high-risk worksites.
- Significant progress in the safety and health performance of large enterprises.
- Significant reduction in occupational death in the construction industry.

**Comparison of occupational accidents in construction industry before and after implementation of Four-Year Plan**



Note: Deaths only covered by Labor Safety and Health Law (4,600,000 workers)  
Source: Department of Labor Inspection, Taiwan Council of Labor Affairs (CLA)

## A new challenge The "Double-Thirty" target

Goal: to reduce the occupational death and disability down to 30% respectively in 2 years (2006-2007).

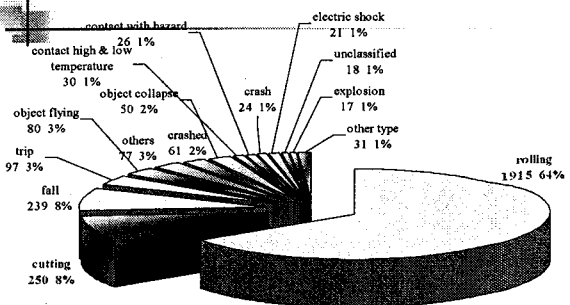
key strategy

- Precise and effective inspection.
- Establishment of safety alliances.
- Development of a counseling system.
- Enlarge investment in education.

## Plans of Preventing Mechanical Accident

- We hope to reduce the occupational disability down to 30% in 2 years (2006-2007).
- According to 2005 occupational disability payments under labor insurance, rolling / nipping was the most of all accident type, it's 1915 persons injured (64%).
- Power machinery was the most of all accident agency, it injured 1,620 persons (71%).
- Orientation for disaster prevention, focus on mechanical hazard of precaution.

**Distribution of accident type**

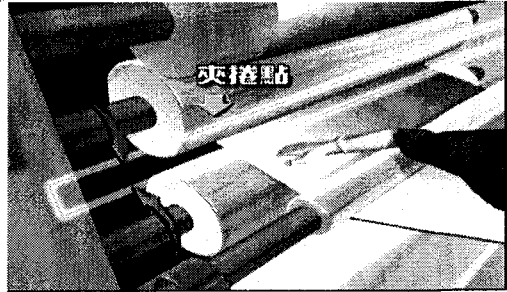


Source: 2005 occupational disability payments under labor insurance

### Rolling



### Rolling



### Don't wear gloves with operating drill machine



### Long hair must be bound



### Don't wear scarf



### Maintenance / repair

#### 維修作業三部曲



Cut off power → Logout → tagout

### Measure of preventing mechanical accident by government

- Providing diagnosis and coach for small and median-size enterprise.
- Revise regulations on labor safety and health.
- Enlarged inspection and education for high-risk worksites of mechanical safety
- Providing partial subsidies for small and median-size enterprise to improve the safety devices of machinery.

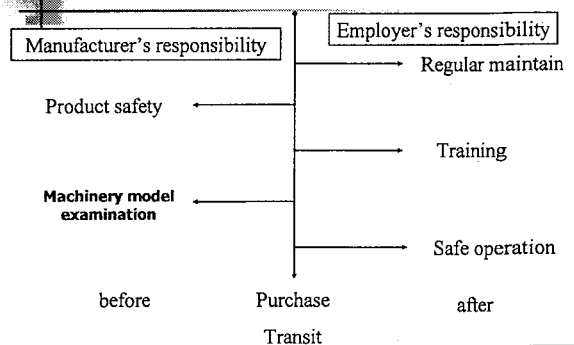
### Key point of Machine Safety

- Safety guard on the rolling/nipping points.
- Emergency brakes of automatic or semiautomatic machinery.
- Safety SOP.
- Shutdown and lockout for overhaul and maintenance.
- Machinery with safety devices regulated by the law.

### Machinery types Classified by Law

- Dangerous machinery
  - Fixed cranes with capacity over 3 ton
  - Mobile cranes with capacity over 3 ton
  - Derricks cranks with capacity over 3 ton
  - Elevators
  - Lifts for construction work
  - Gondolas
- Special machinery
  - Powered press and shear machinery
  - Powered forklifts
  - Manually-operated planers
  - Radial saws for wood process
  - Powered grinding machinery and wheels
- General machinery

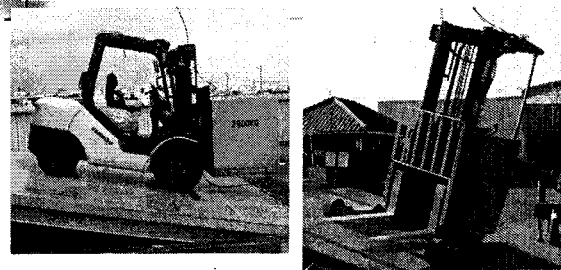
### Machinery model examination



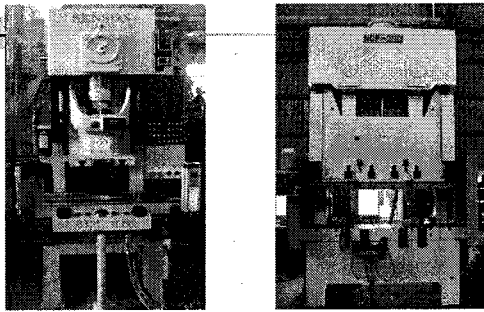
### Machinery Model Examination by Regulation

- Labor Safety and Health Act (article 6)  
Employers shall not install machinery or tools that do not conform to the safety standards established by the competent authority of the central government, to be used by labors.
- Enforcement Rules of the Labor Safety and Health (article 7)  
Employers shall install the following machines, tools or equipment, in accordance with the protective standards:
  1. Powered press and shear machinery,
  2. Manually-operated planers,
  3. Radial saws for wood process,
  4. Powered forklifts,
  5. Powered grinding machinery and wheels.
- Protective Standard for Machinery safety

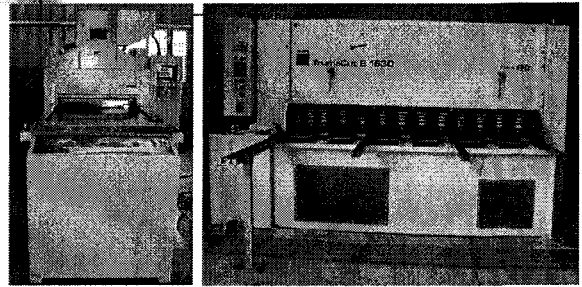
### Powered forklifts



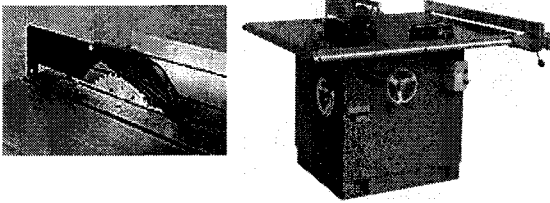
## Powered press



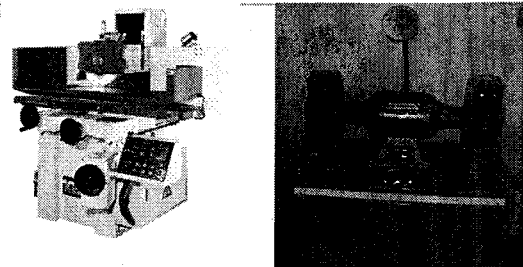
## Shear machinery



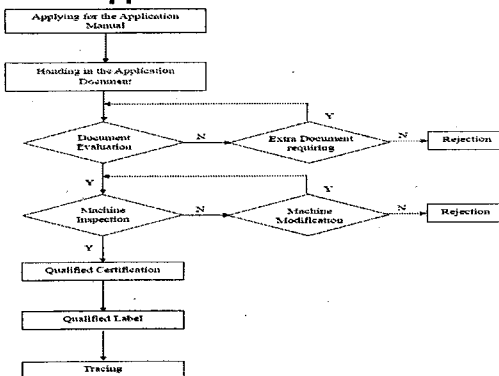
## Radial saws for wood process



## Grinding machinery and wheels



## Machinery Model Examination Application Process Flow



## Application documents for Model Examination of Forklift

- Application form
- Specification of Forklift
- Technical documents
  - A. Drawing of the applying machine
  - B. Drawing of the hydraulic circuits controlling of the machine
  - C. User's operating manual
- User's operation manual
  - A. Explanations for the "attention" or "warning" indexes listed on the machine.
  - B. Attention items when maintaining the machine.
  - C. Items must include in the safety explanations
    - (a) during operating
    - (b) during shipping
    - (c) during assembling or de-assembling
    - (e) during maintenance

## Document Evaluation

- Specification evaluation: evaluating the compatibility between the catalog and the user's operation manual.
- Evaluating the explanation of the model's naming method, photos and machinery drawing.
- Evaluating the user's operating manual
- Same model evaluation

## Mechanical Inspection

- Effectiveness of precautions for hazard elimination or reduction
- Effectiveness of the interlock between safety and hazard precautions
- Effectiveness of hazard warning signs and labels
- Considering Potential hazard not happened yet

## Application Form of model examination for Forklift

Model Name	
Manufacturer	
Address	
Applicant	
Address	
Specification of Forklift	Motor: Size: Others:
Location to conduct	
Attachments	

Date \_\_\_\_\_  
 Contact person \_\_\_\_\_  
 Telephone no. \_\_\_\_\_  
 Signature of Applicant \_\_\_\_\_

## Certification

**動力衝壓機械  
型式檢定合格證明書**

申請人名稱：\*\*\*  
 申請人地址：\*\*\*  
 製造商名稱：\*\*\*  
 製造商地址：\*\*\*  
 型式檢定合格之機：\*\*\*  
 檢定合格之機之規格：\*\*\*  
 檢定合格之機之用途：\*\*\*  
 檢定合格之機之規格：\*\*\*  
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 檢定合格之機之用途：\*\*\*

中華民國93年2月

檢定合格之機之規格：\*\*\*  
 檢定合格之機之用途：\*\*\*

行政院勞工委員會機械  
 安全二字第0950011291號

## Qualified label



## Approved machine number of model examination (2006/06/30)

Year	Press	Forklift	Grinder	planer	Radial Saw	Total
1995	1	0	0	0	0	1
1996	3	6	0	0	0	9
1997	1	1	2	5	0	9
1998	1	58	2	0	3	64
1999	6	18	0	0	0	24
2000	10	30	2	0	0	42
2001	8	20	0	0	1	29
2002	4	27	5	0	0	36
2003	3	70	1	0	1	75
2004	4	38	2	0	0	44
2005	7	41	2	0	0	50
2006	7	18	2	0	0	27
Total	55	327	18	5	5	410

## Applied labels for model examination (2006/06/30)

Machine Type	Applied Label
Forklift Truck	36,153
Press	3,430
Grinder	1775
Radial Saw	110
Total	41,468

## Machine type VS occupational accident & compensation

Year		Radial Saw (131)	Planer (133)	Grinder (153)	Press and Shear (154)	Forklift Truck (222)	Total
2005	No. Accident	35	6	12	467	39	559
	compe. (million)	6,228,188	1,053,945	1,743,660	80,272,671	21,991,274	111,289,738
	Avg. cost	177,948	175,658	145,305	171,890	563,879	198,732
2004	No. Accident	18	3	10	503	40	574
	compe. (million)	2,647,353	403,797	1,335,720	93,970,447	12,190,448	110,547,765
	Avg. cost	147,075	134,599	133,572	186,820	304,761	193,943
2003	No. Accident	14	5	49	507	21	596
	compe. (million)	2,550,255	1,015,200	6,285,756	83,492,054	5,809,902	99,153,167
	Avg. cost	182,161	203,040	128,281	164,679	276,662	166,364
1997	No. Accident	283	42	129	1249	289	1992
Avg. Cost		169,061	171,099	135,719	174,463	281,767	186,346

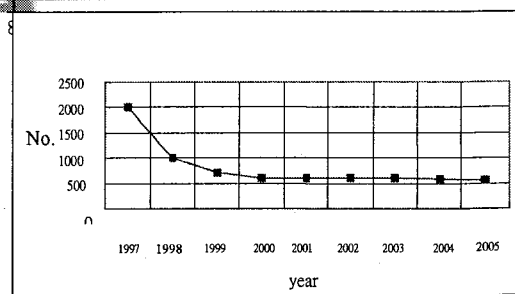
Note : 1\* 1997 data from annual report of labor statistics.  
2. 2003-2005 data from yearbook of labor insurance statistics.

## Machine type VS occupational disabilities and deaths

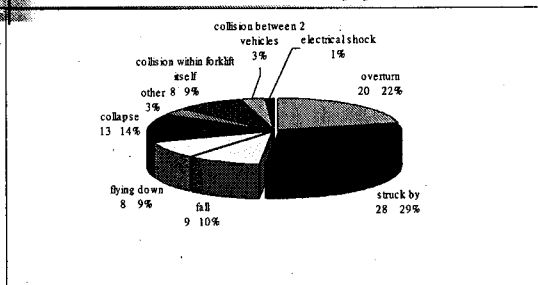
Year	Type	Radial Saw (131)	Feed planer (133)	Grinder (153)	Press and Shear (154)	Forklift Truck (222)	Total application quantity of disability and death	Annual quantity of occupational disability and death	Ratio of occurrence %
2005	Disability	35	6	12	467	39	2001	2001	Unafficent data
	Death	0	0	0	1	13	40		
	Total	35	6	12	468	52	2041		
	%	--	--	--	--	--	--		
2004	Disability	18	3	10	502	35	2384	38,165	6.3
	Death	0	0	0	1	5	33		
	Total	18	3	10	503	40	2417		
	%	0.047%	0.007%	0.026%	1.318%	0.105%	6.355%		
2003	Disability	14	5	49	506	19	1878	38,488	5.2
	Death	0	0	0	1	2	38		
	Total	14	5	49	507	21	1914		
	%	0.038%	0.014%	0.134%	1.388%	0.058%	5.246%		

Data source : yearbook of labor insurance statistics.

## Number of occupational accident for 5 machinery



## Frequency of accident type for forklift 10 fatalities every year



Source: 1997-2005 occupational fatalities for forklift

## Cause of struck by for forklift

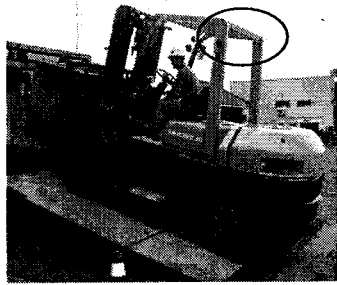
ratio	Cause of accident
28 persons	1. Uncertified person operates forklift
29%	2. Operator leave the key or doesn't brake when away forklift.
	3. The loads are piled up too high, the vision is not well.
	4. Speed too fast.
	5. Operator doesn't use warning or other signal.
	6. Pedestrian without attention.
	7. Entrances and exits
	8. Insufficient light and noise

Source: 1997-2005 occupational fatalities for forklift





### Without rear of lighting device



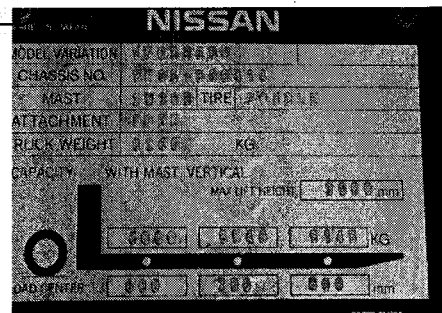
### Rear support frame isn't installed



### Maximum load is labeled



### Allowable loading is labeled



### Case Study 4 Forklift & Powered Press

- No hand brake, no survive  
The driver stopped and walked to the forklift forward, bended the knee and head to look the front tire or loads. He doesn't brake and the ground isn't flat.
- Cutting fingers with working powered press is normal  
He is engaged in dangerous work, must he accept the risk?

### Courses and hours of trainings for driving forklifts with capacity over 1 ton (18h)

- 1.Laws and regulations of forklifts 1h
- 2.Relative apparatus of forklifts traveling and operations 2h
- 3.Structure and operation of loading and unloading apparatus of forklifts 3h
- 4.Dynamics relating to operation of forklifts 2h
- 5.Self-inspection and accident prevention of forklifts 2h
- 6.Practice of forklifts traveling and operation 8h

## Hazard of powered press 450 hand disable every year



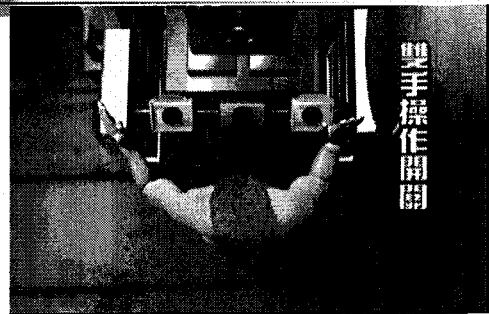
## Safety device of powered press

- Safety guard
- Protective safety device
- Two-hands control device
- Presence sensing safety device
- Pullback safety device
- Sweep safety device
- Holding tools

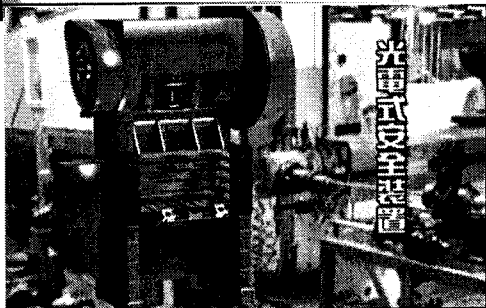
## Safety Guard



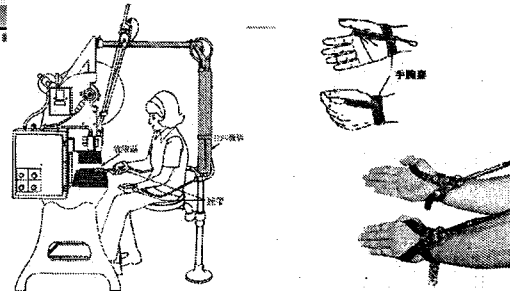
## Two-hand control device



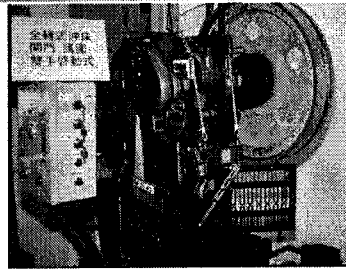
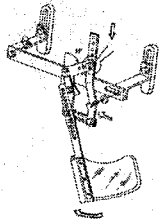
## Presence sensing safety device



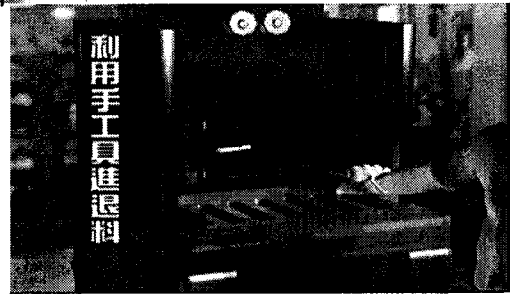
## Pullback safety device



## Sweep safety device

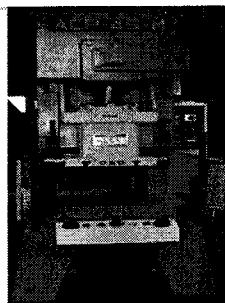


## Holding tools



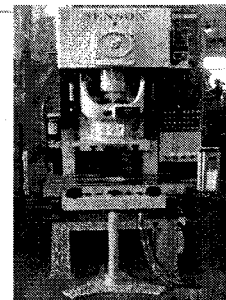
## Two hands can control simultaneously

- The safety device must be with the construction to prevent slides from action when it is not operated with two hands simultaneously.



## Device to prevent a machine from restarting

- The safety device must have the construction to prevent the device from action when both hands are still on the single stroke button.



## Label of safety device

- Presence Sensing Safety Device: the time from fingers interfere until emergency stop activate

雙手操作式安全裝置之運動時間	T12	T12 =	25.1	ms
光電感應式之運動時間	T11	T11 =	20	ms
使用中之衝壓機停止時間	Ts	Ts =	229	ms
安全裝置之安全距離	Dm	雙手操作式 Dm =	407	mm
		光電感應式 Dm =	440	mm

## Conclusion

- Prevention is better than cure. Safe machinery is the first step to protect the worker's security.
- Promotion of enforcement of machinery model examination: reducing occupational injuries.
- More high-risk machinery into the scope of machinery model examination.
- Factors to reduce occupational injuries
  - Regular repairing
  - Training
  - Safety SOP
  - ....

Florence Nightingale said, "**The nursing of the sick, is a vocation as well as a profession.**"



**Thanks for your listening**

