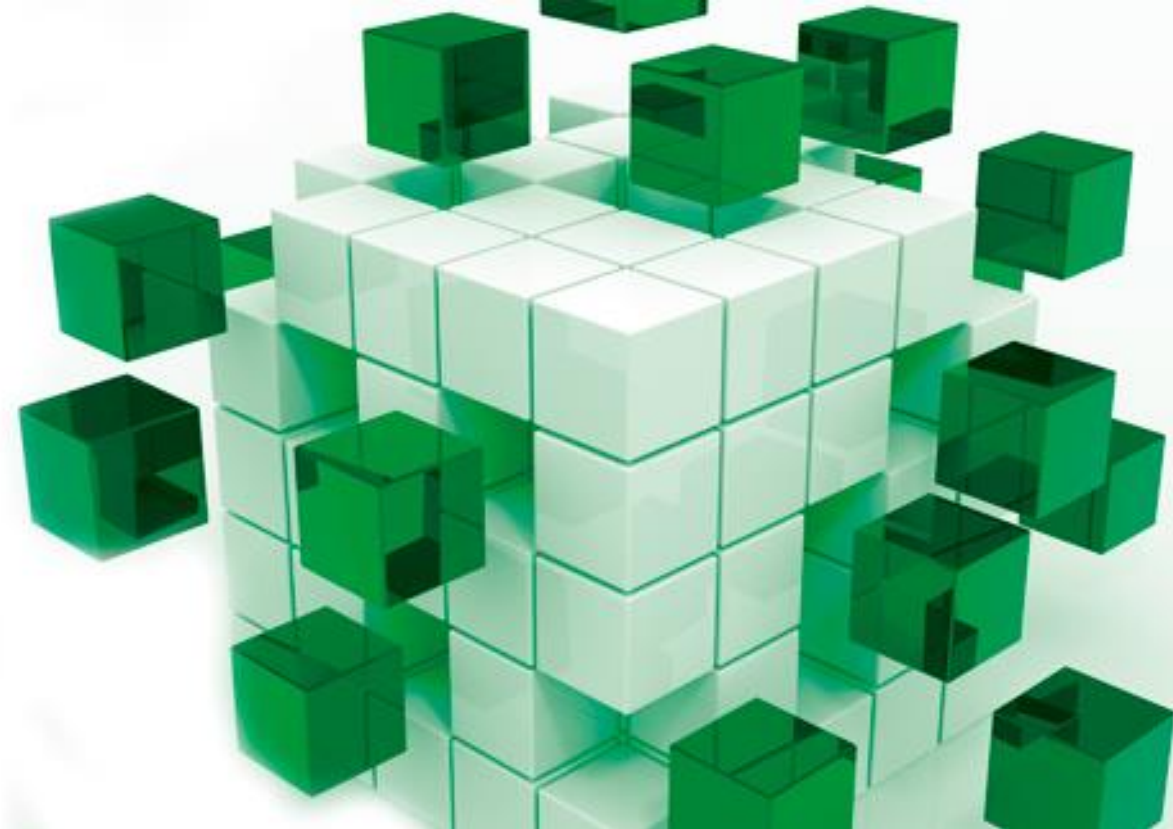


# XVIII Congreso de Confiabilidad

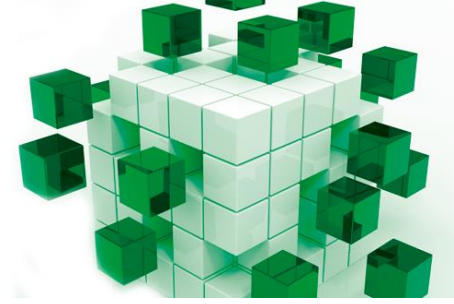
Madrid. 23 y 24 de noviembre de 2016



Organiza:



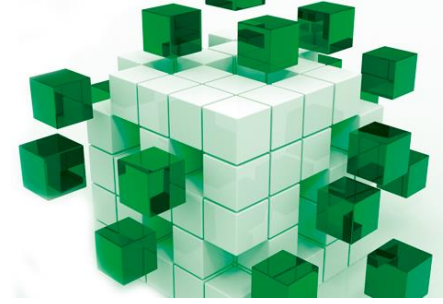
ASOCIACIÓN ESPAÑOLA PARA LA CALIDAD



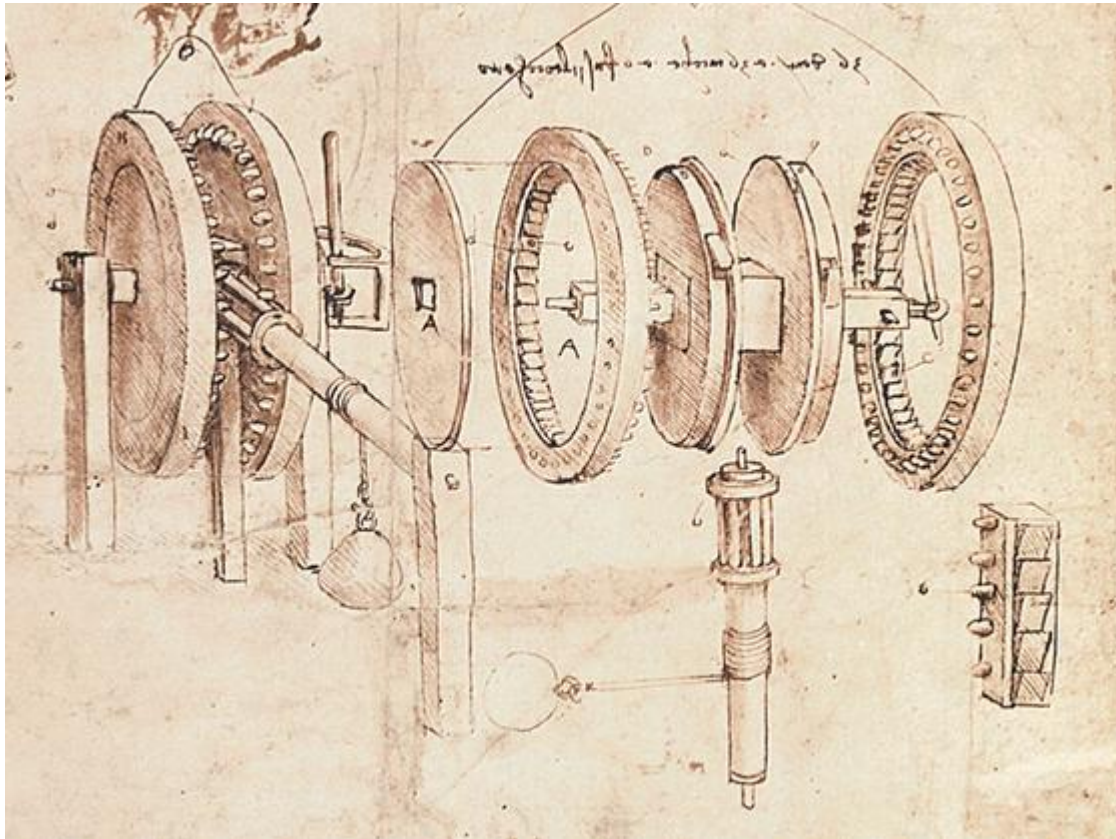
# **Gestión de Maquinaria basada en Riesgos: API 691**

**Jorge Asiain, CEng**

**Profesor Ingeniería Mecánica, Universidad Europea  
Socio-Fundador, AlterEvo Ltd.**

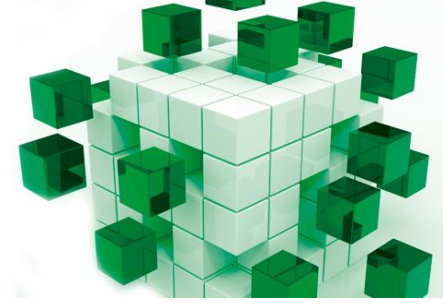


## Introducción



**Identificación del riesgo y su gestión a lo largo del ciclo de vida de las máquinas.**

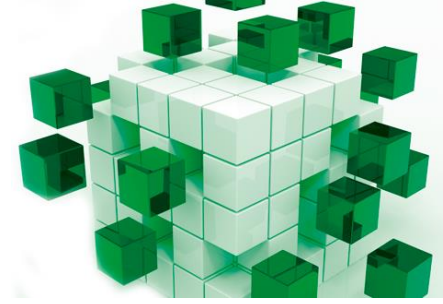
# XVIII Congreso de Confiabilidad



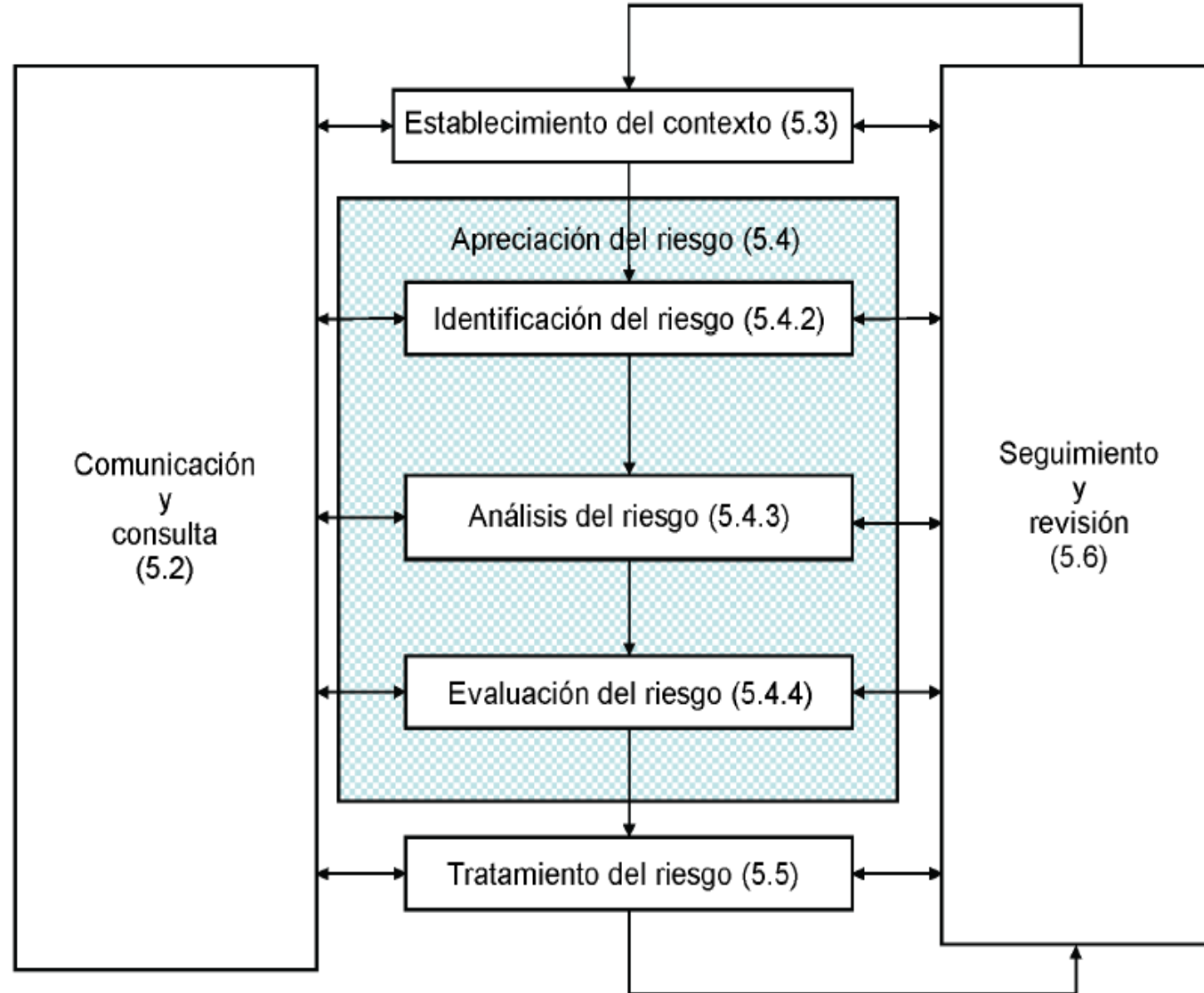
Concepto de Riesgo

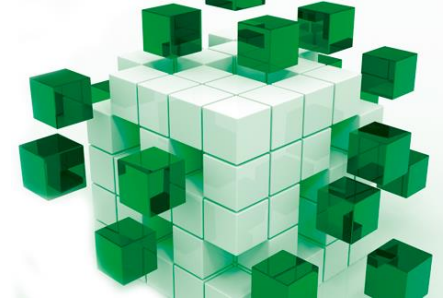
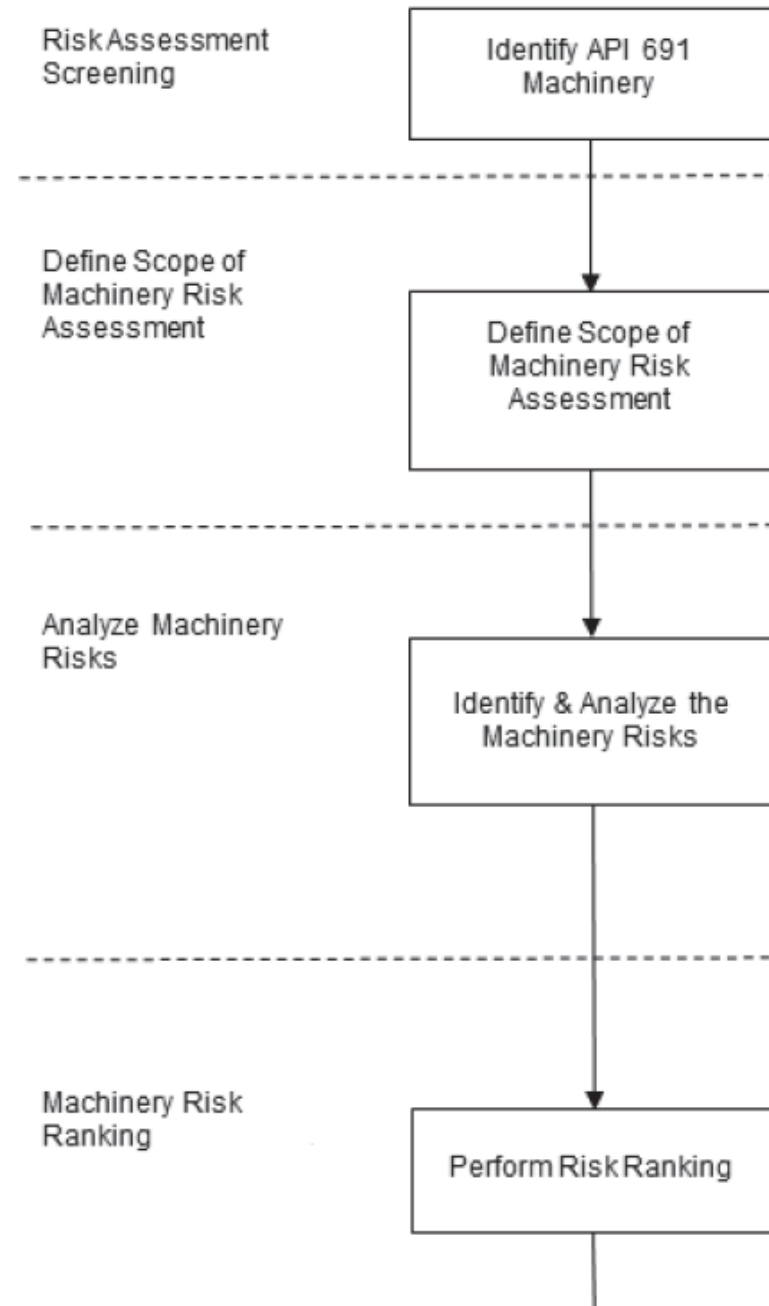
**RIESGO = PROBABILIDAD X CONSECUENCIA**

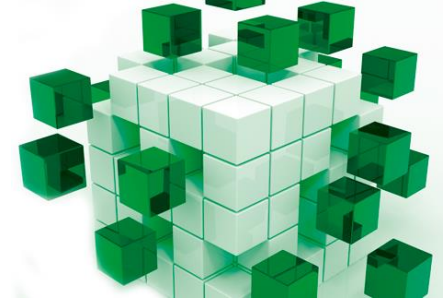




## Gestión de Riesgo







## Evaluación de Riesgo

**HAZOP**

**LOPA**

**Análisis RAM**

**What-If**

**FMEA**

**CheckList**

**FTA**

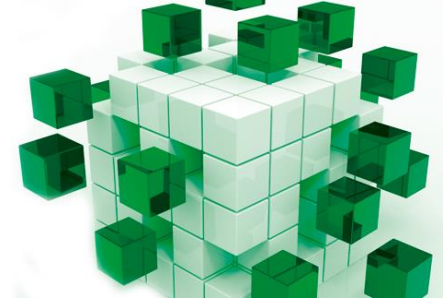
# XVIII Congreso de Confiabilidad

## Evaluación de Riesgo

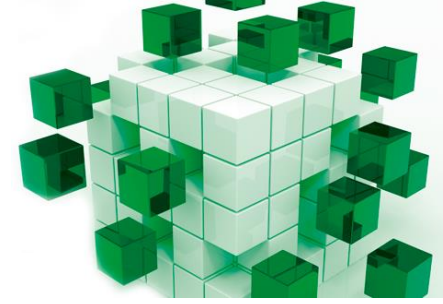
Quantitative	Qualitative	PROBABILITY	5 Almost Certain	Medium	Medium	High	High	High
> 1 in 20	Likely to occur frequently		4 Probable	Medium	Medium	Medium	High	High
> 1 in 100	Will occur several times in the life of the product		3 Possible	Low	Medium	Medium	Medium	High
> 1 in 500	Likely to occur sometime in product life		2 Unlikely	Low	Low	Medium	Medium	Medium
> 1 in 5000	Unlikely, but possible to occur during product life		1 Rare	Low	Low	Low	Medium	Medium
< 1 in 5000	Failure is unlikely, it can be assumed that occurrence may not be experienced							

1 Negligible	2 Minor	3 Significant	4 Major	5 Catastrophic
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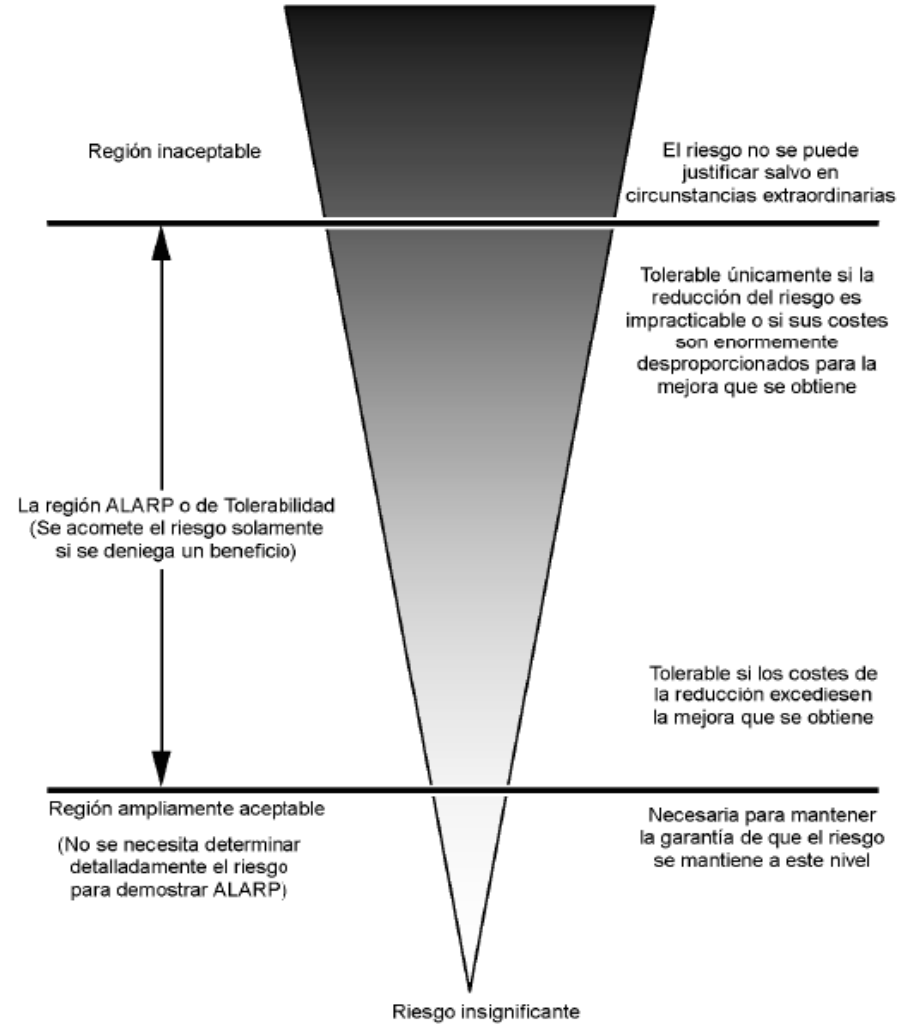
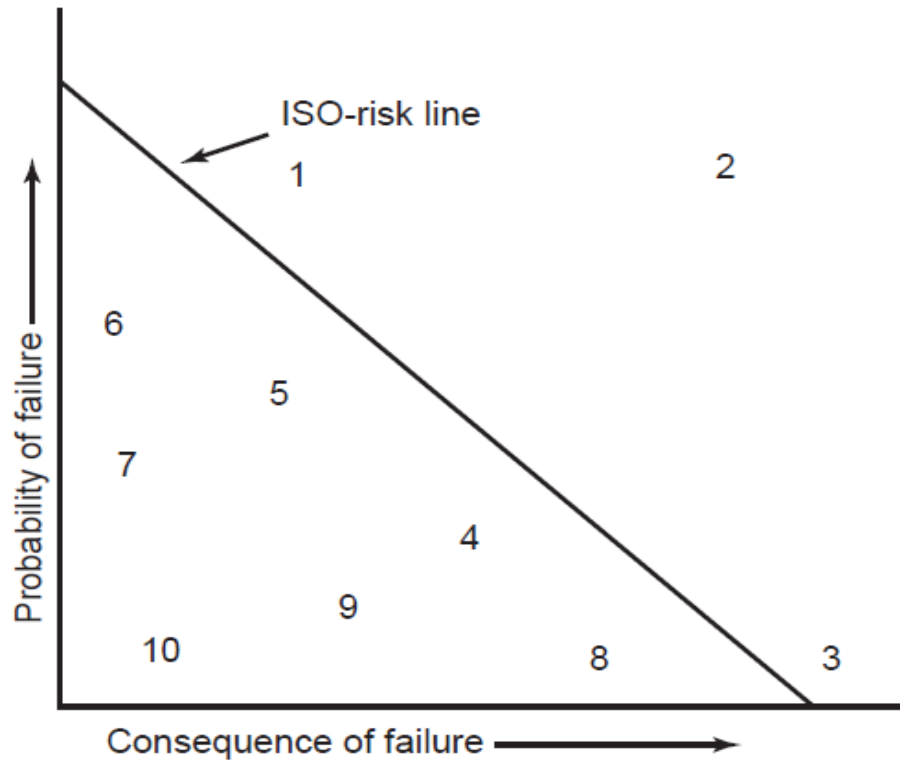
SEVERITY					
Safety	Negligible impact or exposure	Minor injury or minor first-aid case	Minor injury requiring medical treatment	Lost time incident; severe injury	Potential fatality or permanent disability
Environment	Spill to containment or minimal release; no long-term consequences	Environmental impact is short term and contained within site; no remediation required	Environmental impact is short term; significant release; spill not contained on-site; some remediation required	Environmental impact is medium term and external to facility; major release; major remediation work	Environmental impact is long term, external to facility; very large spill; massive remediation necessary
Economic	No significant impact on operations; no loss of revenue	Damage to equipment; minor impact on operations; no loss of revenue	Severe damage to equipment; impact on plant operations; partial loss of revenue	Major damage to equipment; delay in operations; short-term loss of revenue	Long-term impact on operations; long-term loss of revenue

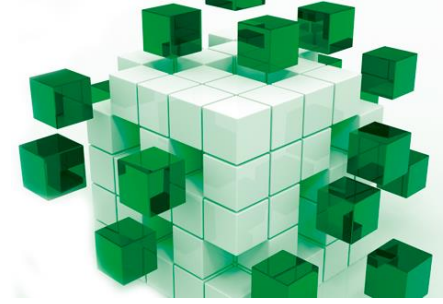




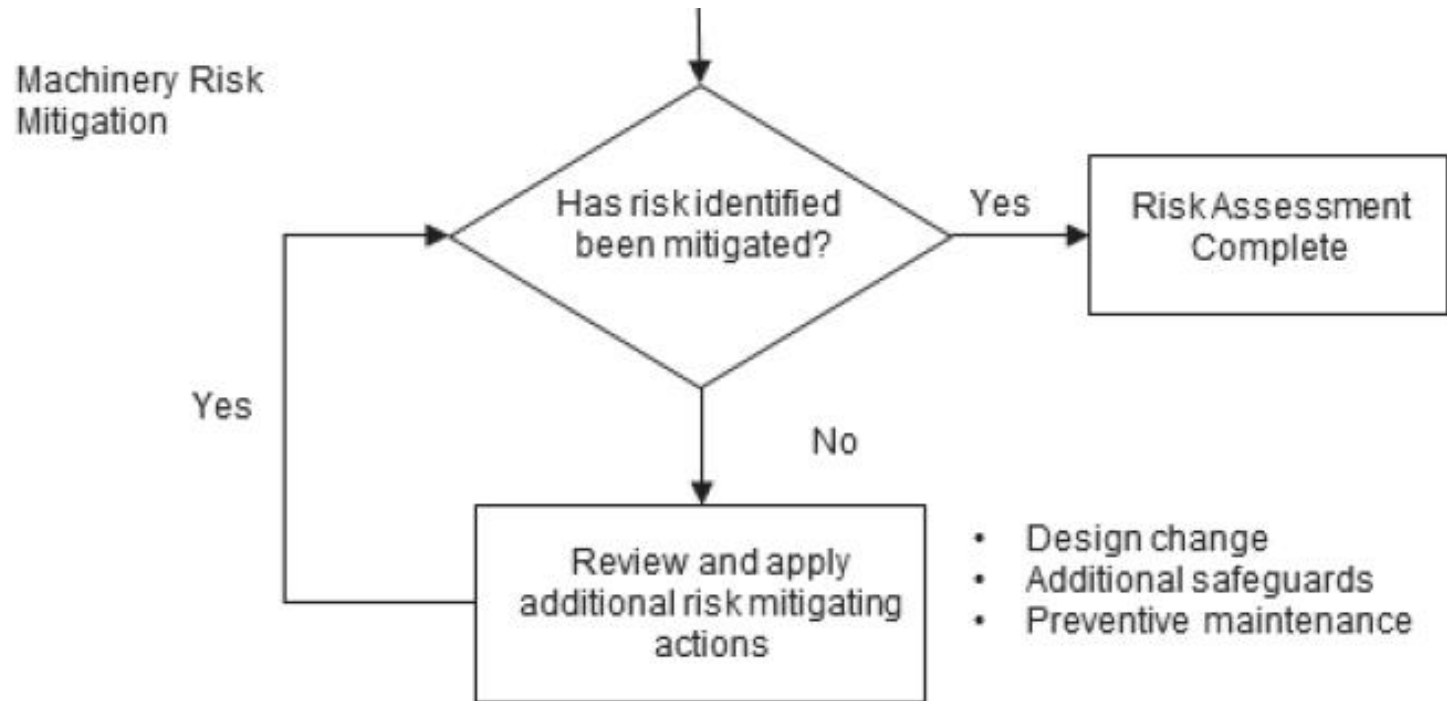


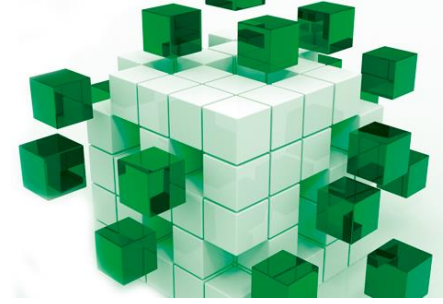
## Evaluación de Riesgo





## Mitigación de Riesgo





## Mitigación de Riesgo

### **API 691:**

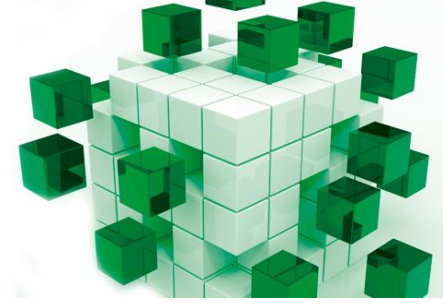
Vigilancia y Control  
Mantenimiento Preventivo  
Control de la Condición  
Tareas de Búsqueda de Fallos

### **ISO 17776:**

Prevención  
Detección  
Control  
Mitigación de Efectos  
Respuesta de Emergencia

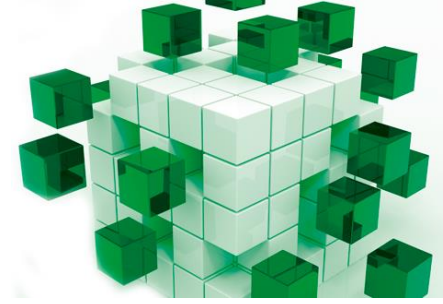
### **ISO 31000:**

Posibilidad Técnica  
Contribución a la Reducción del Riesgo  
Coste y Riesgo de su Implantación  
Grado de Incertidumbre

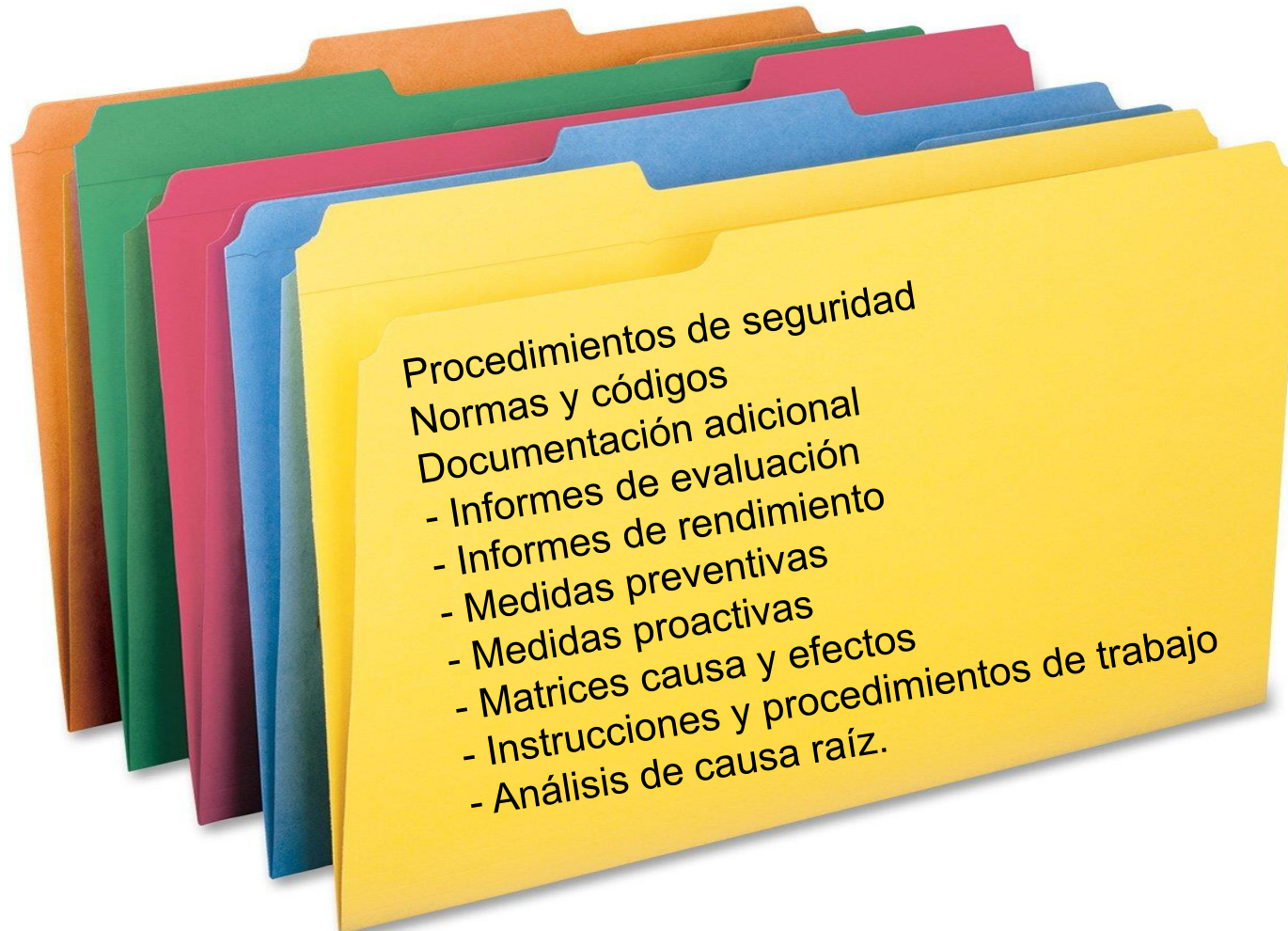


## Gestión de Riesgos y Ciclo de Vida del Equipo

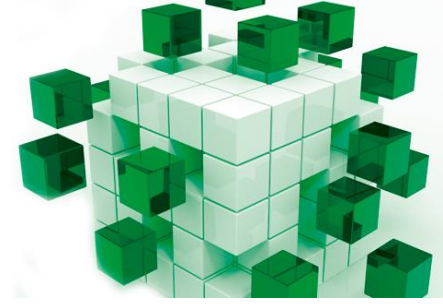
API 691	CONCEPTO	ADQUISICIÓN	ISO 55001
	DISEÑO INGENIERÍA		
	DISEÑO DE DETALLE		
	INSTALACIÓN Y PUESTA EN MARCHA		
OPERACIÓN Y MANTENIMIENTO	OPERACIÓN		
	MANTENIMIENTO		
	ELIMINACIÓN		



## Registro

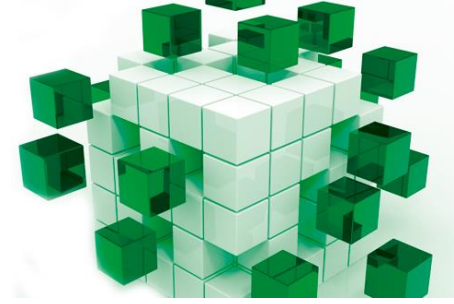


# XVIII Congreso de Confiabilidad



## Formación





## Conclusiones

- ✓ Metodología basada en riesgos para la gestión de maquinaria a lo largo de todo su ciclo de vida.
- ✓ Incluye desde los riesgos a las personas y al medioambiente hasta el riesgo de pérdidas de inversiones, de producción y de exceso de costes de operación.
- ✓ No es la primera norma que propone este método de gestión, otras son API RP 580, ISO 17776, ISO 31000 o NS Z-008.
- ✓ Es un buen complemento a la norma ISO 55000 sobre Gestión de Activos.