Major Process Safety Incident vs Root Cause Map

(Quick Reference Guide)

IChemE
Safety & Loss Prevention Special Interest Group

Sector		Date	Event	Country	Type	Fatalities	Injuries	Abnormal Operations	Escalation Potential	Earthquake	Tsunami	Flood	Hurricane	Extreme Cold or Ice	Process Design	Hazard Identification	Equipment/Piping Design	Matterials of Construction	Instrumentation	Safety Instrumented Systems	Protective Systems	Plant Layout	Occupied Buildings	Hazard Awareness	Process Control	Process Monitoring	Alarm Management	Creeping Change	Risk Assessment	Work Planning	Control of Work	Energy Isolation	Housekeeping	Material Degradation	Inspection	Preventative Maintenance	Human Factors	Role Clarity	Personal Protective Equipment	Communication	Procedures	Training	Management of Change	Emergency Preparedness	Failure to Learn	Production over Safety	Normalisation of Deviance	Process Safety Management	Design Standards	Land Use Planning	Regulatory Compliance Audits	Investigation Reports
								Context		Natural Hazards					Design Factors									Operations Factors					Maintenance Factors								Personal			Competency			Culture						Regulator			Links
Oil & Gas	Upstream	06-Jul-88	Piper Alpha	UK	Explosion	167	?										X				X	X							X		**X**	X					X			X	X	X	X	X				X				Click
Oil & Gas	Upstream	27-Jul-05	Mumbai High North	India	Explosion	22	?								X							X		X					X								**X**	X		X	X	X									X	
Oil & Gas	Upstream	20-Apr-10	Macondo	USA	Explosion	11	17	X							X	X	X		X	X						X			X							X	X	X		X	X	**X**		X				X	X		X	Click
Oil & Gas	Upstream	11-Feb-15	Camarupim	Brazil	Explosion	9	26	X							X	X			X			X		X					X		X						X	X		X	X	X	**X**	X		X		X			X	
Oil & Gas	LNG	19-Jan-04	Skikda	Algeria	Explosion	26	74		X						X			?	X			X	X													X	X					X		X				X	X	X		
Oil & Gas	GPP	25-Sep-98	Longford	Australia	Fire	2	8	X								**X**				X				X		X	X							X			X			X	X	X		X			X	X			X	Click
Oil & Gas	Downstream	04-Jan-66	Feyzin	France	BLEVE	18	84								X		X				X			X																	**X**	X		X					X			Click
Oil & Gas	Downstream	23-Jul-84	Romeoville	USA	Explosion	17	22									X		X						X										**X**	X						X								X			
Oil & Gas	Downstream	22-Mar-87	Grangemouth	UK	Explosion	1	0	X	X							X	X		X	**X**	X			X							X										X	X	X		X	X		X				Click
Oil & Gas	Downstream	05-May-88	Norco	USA	Explosion	8	18															X	X											X									X							X		
Oil & Gas	Downstream	24-Jul-94	Milford Haven	UK	Explosion	0	26	X	X								X		X							X	X		X		X			X	**X**	X	X			X		X	X	X				X				Click
Oil & Gas	Downstream	23-Feb-99	Avon	USA	Fire	4	1	X								X												X	X	X	**X**	X		X	X	X					X	X	X			X		X				Click
Oil & Gas	Downstream	17-Aug-99	Izmit	Turkey	Fire	0	0		X	X					X														X					X								X		X							X	
Oil & Gas	Downstream	16-Apr-01	Humber	UK	Explosion	0	5		X							X	X																	X	X	X				X			**X**					X				Click
Oil & Gas	Downstream	23-Mar-05	Texas City	USA	Explosion	15	180	X							X	X			X				X			X		X	X		X			X		X	X	X		X	**X**	X	X		X	X	X	X			X	Click
Oil & Gas	Downstream	05-Nov-05	Delaware City	USA	Asphyxiation	2	0																	X							**X**						X				X	X										Click
Oil & Gas	Downstream	16-Feb-07	McKee	USA	Fire	0	4		X					X	X	X				X		X							X						X								**X**						X			Click
Oil & Gas	Downstream	02-Apr-10	Anacortes	USA	Explosion	7	0	X								X	X	**X**	X							X		X						X							X						X	X	X		X	Click
Oil & Gas	Downstream	06-Aug-12	Richmond	USA	Fire	0	26											**X**											X					X	X									X		X		X	X	X		Click
Oil & Gas	Downstream	18-Feb-15	Torrance	USA	Explosion	0	4	X	X							X			X																						X		X		X			X				Click
Oil & Gas	Ship	24-Mar-89	Valdez	USA	Pollution	0	0		X					X			X		X							X											**X**			X	X	X		X				X			X	
Oil & Gas	Rail	06-Jul-13	Lac Mégantic	Canada	Fire	47	?									X	X				X							X	X					X			X				**X**	X	X	X		X		X			X	
Oil & Gas	Terminal	19-Nov-84	San Juan Ixhuatepec	Mexico	BLEVE	542	4,248										X		X	X	X	X						X	X							X						X	**X**	X		X		X	X	X		
Oil & Gas	Terminal	11-Dec-05	Buncefield	UK	Explosion	0	43		X						X	**X**			X	X		X			X	X		X	X							X	X			X	X	X	X	X		X		X		X		
Oil & Gas	Terminal	23-Oct-09	Bayamón	Puerto Rico	Explosion	0	?								X	X				X																					X	X		X	X							Click
Petrohemical	Manufacture	01-Jun-74	Flixborough	UK	Explosion	28	104	X	X													X	X	X					X					X	X		X			X	X	X	**X**	X		X		X		X		
Petrohemical	Manufacture	23-Oct-89	Pasadena	USA	Explosion	23	314	X									X		X		X	X									**X**	X				X				X	X	X	X	X	X		X	X				
Petrohemical	Manufacture	21-Sep-92	Castleford	UK	Fire	5	201	X														X	X	X					X		**X**						X					X	X	X	X			X				Click
Petrohemical	Manufacture	01-Feb-94	Ellesmere Port	UK	Fire	0	18		X							X	X		X					X										X	X	**X**				X	X	X		X				X	X			Click
Petrohemical	Manufacture	27-Mar-98	Hahnville	USA	Asphyxiation	1	1									X								X					X		**X**										X											Click
Petrohemical	Manufacture	13-Jun-13	Geismar	USA	BLEVE	2	167	X								X								X																X	X		**X**		X			X				Click
Petrohemical	Manufacture	03-Jun-14	Moerdijk	Netherlands	Explosion	0	2	X								X			X	X				X	X												X			**X**	X	X	X	X	X			X			X	
Petrohemical	Manufacture	31-Aug-17	Crosby	USA	Fire	0	21					**X**	X			X																												X					X	X		Click
Agrochemical	Manuf.	10-Jul-76	Seveso	Italy	Toxic Release	0	~ 500	X	X						X	X			X	X				X	X												X			X	**X**			X			X	X	X			
Agrochemical	Manuf.	03-Dec-84	Bhopal	India	Toxic Release	2153	>200,000	X							**X**	X		X						X					X							X	X				X	X	X	X		X		X		X		
Agrochemical	Manuf.	21-Sep-01	Toulouse	France	Explosion	31	2442		X							X		X				X		X					**X**				X								X	X		X	X			X		X		Click
Agrochemical	Manuf.	15-Nov-14	La Porte	USA	Toxic Release	4	0	X								X	X				X		X	X			X		X		X					X	X		X	X	X	X	X	X	X		X	**X**	X		X	Click
Agrochemical	Store	17-Apr-13	West	USA	Explosion	15	> 160		X							X		**X**				X		X					X													X		X	X					X	X	Click
Pharma	Manuf.	04-Jan-92	Grimsby	UK	Runaway	0	0	X	X						**X**	X			X						X			X	X												X		X				X					
Pharma	Manuf.	29-Jan-03	Kinston	USA	Explosion	6	38									**X**	X				X		X	X					X				X							X	X	X						X	X			Click
Pharma	Manuf.	28-Apr-08	Cork	Ireland	Runaway	1	1								X	**X**	X												X								X				X	X		X					X			
Power Gen	Nuclear	28-Mar-79	Three Mile Island	USA	Near Miss	0	0		X						X	X			X			X					**X**										X			X	X	X		X							X	
Power Gen	Nuclear	26-Apr-86	Chernobyl	Russia	Explosion	> 30	~ 7,000	X	X						X	X	X			X				X													X			X	X	X	**X**	X	X	X		X			X	
Power Gen	Nuclear	11-Mar-11	Fukushima Daiichi	Japan	Explosion	0	13		X	X	X					X			X			X							**X**												X	X		X				X			X	
Power Gen	Coal	08-Apr-99	Gannon	USA	Explosion	3	45																								X										X											
Power Gen	Coal	10-Nov-07	Dallman	USA	Explosion	0	0	X	X											X			X		?	?										X																
Water	Dist	23-May-84	Abbeystead	UK	Explosion	16	28	X							X	**X**			X					X																	X	X	X						X			Click
Water	Treat	06-Jul-88	Camelford	UK	Pollution	0	?									X						X							X								**X**			X	X	X		X				X				
Water	Treat	05-Apr-93	Milwaukee	USA	Disease	69	>403,000								**X**	X									X	X																X		X		X						
Food		03-Sep-91	Hamlet	USA	Fire	25	54									X			X	X	X	X	X						X						X		X			X		X		X	X	X	X	X	X		**X**	Click
Food		07-Feb-08	Port Wentworth	USA	Explosion	14	36								X	X								**X**					X				X				X			X	X	X	X	X	X		X	X			X	Click