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Experiences with Process Safety KPIs at BASF

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Content

- **Why Process Safety KPIs ?**
- **Definitions**
- **History and trends**
- **Examples of learnings**
- **Summary of experiences, recommendations**
 - **Summary FER, AFPD**
 - **Relevance of KPIs**
 - **Recommendations for implementation**

Why Process Safety KPIs?

- **You can't manage what you don't measure!**
- **Lots of activities, but how do we know our Process Safety programs are effective?**
- **Is our performance improving ?
What are the improvement potentials ?**
- **How much variance throughout the company ?**
 - **Regions, Sites, Divisions, Technologies, ...**
- **How do we compare to other companies ?**

Starting point: Baker report (2005 Texas City Expl.)

■ 2005 Introduction of Process Safety KPIs:

- **KPI ,FER‘**
 - **lagging indicator**
 - Fires, Explosions, Releases
- **KPI ,AFPD‘**
 - **leading indicator**
 - Activation or Failure of Protective Developments



■ 2008 Introduction of global database for KPIs and other incidents

Definitions of BASF Process Safety KPIs

Fires, Explosions and Releases

FER

- Incident in a process resulting in a fire, explosion/implosion or release of substance **–and–**
 - A fatality or LTI injury, **or**
 - Property damage > 25,000 €, **or**
 - Release of substances exceeding thresholds (see table), **or**
 - Off-site impact (evacuation, injury outside fence line, press release, ...)

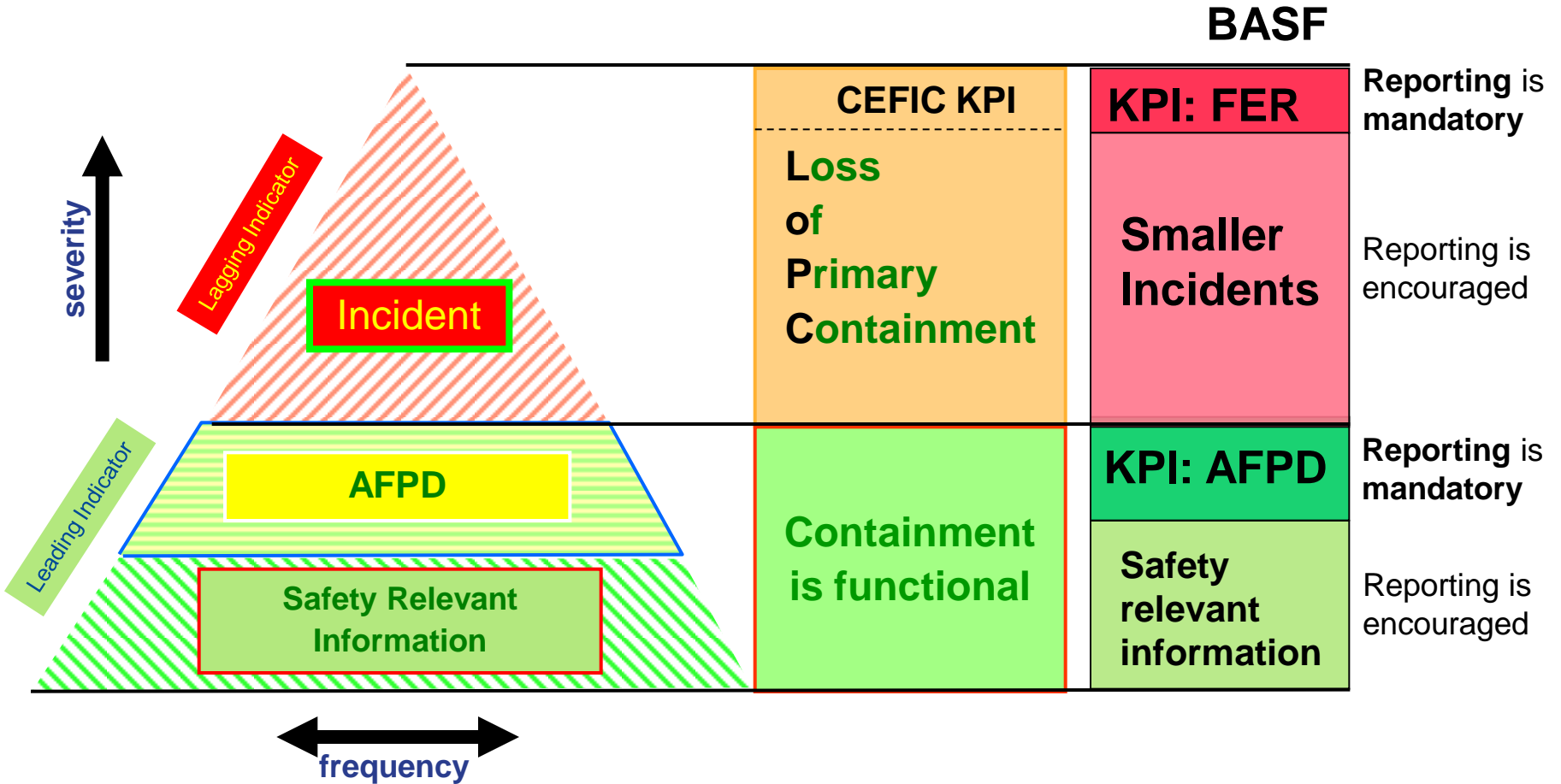
Material	EU-Symbol	Released quantity
Highly toxic	T+	More than 5 kg
Toxic, explosive, extremely flammable, oxidizing, caustic, harmful to health,...	T, E, F+, O, C, Xn, Xi, N, F	More than 100 kg
Not classified	-	More than 2,000 kg

Activation or Failure of Protective Devices

AFPD

- Activation or Failure of Protective Device
- Protective devices are:
 - Safety valves
 - Rupture discs
 - 'Z' designated protective devices (Alarms, Interlocks)
- Exceptions for intentional activities are defined by the operations managers

Definition of BASF's KPIs compared to VCI proposal



Examples of learnings

- **Stable year to year distribution of incident types**
 - Releases >90%
 - Fires ~5%
 - Explosions <1%
- **Ratio none-FER/FER** ~7
- **Incidents in ,transient-state-conditions‘** ~35%
- **Regional differences in reporting and incidents rates**
 - Europe: Big sites with stable reporting, low incident rate
 - North America: Stable reporting, Inc. rate higher than Europe
 - Asia: Inc. reporting runs into cultural difficulties
- **Divisional differences in incident rate**
 - Wide variation of incident rates depending on type of plant (e.g. petrochemical vs. blending)
- **Specific learnings regarding incident ‘hot spots’ enable improvements**

■ Lagging KPI „FER“:

- After 2-3 yrs widely accepted as performance indicator
- Useful for big chemical plants but less suited for small sites or plants with mainly blending operations, if reporting thresholds are the same as in big plants
- Difficulty of forming a meaningful ‚rate‘.
Rate per million working hours only useful for similar plants/sites

■ Leading KPI „AFPD“:

- More acceptance issues than with ‚FER‘
- Suited mainly for plants with many interlocks
- Synergetic effects: Helps identify process control improvements

Experiences: Relevance of KPIs

- KPI ‚FER‘ evaluations allow safety experts to identify improvement potentials in the process safety management system
- Are the selected KPIs well focused on hazard potentials ?
 - Plants see registration of smaller incidents sometimes as a nuisance, e.g. AFRD
 - There are PSI with significant escalation potential, which do not fit the KPI criteria of FER, AFRD
- ➔ KPIs with more direct correlation to the causes of severe accidents would be helpful, but would be more plant specific

- **Definitions of company wide KPIs should be simple, easy to understand**
- **Reporting tools should be userfriendly**
- **Evaluation of incident causes should be considered right from the start in database setup**
- **Few additional meaningful leading indicators would be beneficial (e.g. open action items from safety reviews)**

Experiences regarding KPI implementation

- **Management support** is key: KPI implementation strongly benefits from support of regional, divisional or site leadership
- **Cultural adaptations** in communication help to overcome regional differences in reporting
- Intensive **communication with plant** employees and management is necessary for understanding and acceptance of KPI reporting
- **Feedback on evaluation results** to plant management helps to demonstrate the benefits of systematic KPI reporting to those who have most of the work with it