Technical Safety Authority of Saskatchewan

2202 2nd Avenue Regina, SK S4R 1K3
PH: (306)798-7111 Toll Free: (866)530-8599
FAX: (306)787-9273 Toll Free: (866)760-9255
Website: www.tsask.ca
info@tsask.ca

Overpressure Protection by System Design (OPPSD) Requirements

Information Paper IP-2011-03-01

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1. Scope

This information paper provides guidance to owners with a Quality Management System (QMS) on how to apply the principles of overpressure protection by system design (OPPSD) on appropriate equipment.

2. Exclusions from the Paper

This paper does not apply to:

- Owners who do not have a registered Quality Management System for use in Saskatchewan;
- Any case where the pressure is not self-limiting; or
- Any boiler.

3. Overpressure Protection

Pressure vessels shall be provided with a means of overpressure protection. The use of a pressure relief device (PRD) (rupture disc, pressure relief valve, pressure safety valve) is the preferred and approved standard to safeguard a pressure vessel against overpressure.

The use of OPPSD is an exception to the standard and requires the acceptance and registration of the design by TSASK Codes & Standards Compliance.

4. QMS Holder Requirements

Approval for the use of OPPSD to safeguard pressure vessels is available only to owners with a registered QMS program. The QMS holder shall have engineering, operational and inspection knowledge and resources to analyze, accept and manage all responsibilities and risks associated with pressure vessels operating with overpressure protection provided by system design.

5. Application Requirements

An application for the use of OPPSD shall be submitted to TSASK Codes & Standards Compliance and shall have, as a minimum, the components listed.

5.1. Pressure Vessel List

A detailed list of pressure vessels to be considered for OPPSD. The pressure vessel list shall include for each vessel to be considered:

- TSASK licence number;
- Owner's identification/tracking number;
- manufacturer;
- Canadian Registration Number (CRN);
- operating pressure and temperature;
- maximum allowable working pressure (MAWP); and
- design temperature.

The pressure vessel list shall be stamped, dated and signed by a Professional Engineer as defined in *The Engineering and Geoscience Professions Act* of Saskatchewan.

5.2. Technical Justification for Using OPPSD in Lieu of a PRD

OPPSD is only available in cases where the pressure is self-limiting (e.g., the maximum discharge pressure of a pump or compressor). A description of how the pressure is self-limiting shall be provided for each pressure vessel being considered. The source(s) of pressure shall be indicated as well.

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5.3. *Description of the Design Basis*

A description of the design basis for the OPPSD shall include:

- how the maximum system upset pressure was established;
- evidence that no creditable fire case applies to the pressure vessel directly;
- how the margin between maximum operating and design conditions was established; and
- evidence that all operating and upset scenarios were considered, including scenarios:
  - involving a fire in the system;
  - where upset conditions were a result of operator error; and
  - where equipment and/or instrumentation malfunctions.

5.4. *Overpressure Analysis Summary*

A detailed analysis to identify and examine all potential overpressure scenarios shall be conducted. Results from an overpressure analysis shall be included with the application. Typical overpressure assessment techniques include but are not limited to:

- Hazards and Operability analysis (HazOp);
- Failure Modes, Effects and Criticality Analysis (FMECA); and/or
- "what-if" analysis.

A section summarizing the analysis performed based on the design pressures proposed for all systems shall be included within the OPPSD proposal. The summary submitted with the application shall be stamped, dated and signed by a Professional Engineer as defined in *The Engineering and Geoscience Professions Act* of Saskatchewan.

5.5. *Owner's Endorsement of the Analysis*

If the owner did not perform the risk assessment, then the risk assessment analysis performed in part 5.4 of this document shall be reviewed, supported and endorsed by the owner. The owner shall sign the submitted analysis summary.

Where the engineering work has not been completed by the owner, the summary shall be co-signed by both the owner and an authorized representative of the company completing the work.

5.6. *Established Monitoring System*

A monitoring program shall be established for all pressure vessels within the scope of the OPPSD. The monitoring program shall address the:

- calibration, maintenance and testing requirements for the monitoring devices and instrumentation;
- continuous monitoring of operating conditions and alarms if the MAWP is exceeded;
- administrative procedures to initiate an internal investigation if the system pressure exceeds the maximum operating pressure (not the same as MAWP);
- record retention for the requirements noted; and
- periodic review/audit of the monitoring system.

5.7. *OPPSD Pressure Vessel Identification System*

A visual identification and warning system shall be established for all pressure vessels and pressure sources (e.g., pump or compressor) within the OPPSD program. A physical label is not mandatory where an electronic inventory and work order system is used and the same can incorporate this identification and warning system.

5.8. *Changes to Pressure Vessels or Pressure Sources*

Any alterations, modifications or replacements of pressure vessels or pressure sources that have been identified as part of the OPPSD program shall require a review of the original analysis and system design used to ensure the new design is still adequate to provide overpressure protection.

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6. Owner Statement

Every application shall also include a letter, on the owner's letterhead, from the owner acknowledging their responsibility for OPPSD.

The letter shall state that the owner shall:

- accept the OPPSD as presented and all risks associated with OPPSD;
- update operating procedures and documentation to ensure that operators are informed about the systems safeguarded by OPPSD and that **no changes** to established safe operating limits are permitted;
- create and maintain management-of-change procedures which will prohibit any changes to the maximum operating conditions of the systems safeguarded by OPPSD without first performing an analysis and providing details to TSASK for acceptance;
- update its Quality Management System to specifically address the OPPSD vessels and address and list all records that are kept in regards to the OPPSD;
- provide a safe shutdown procedure for the plant equipment and/or a reduction in pressure procedure in the event that a pressure exceeds safe operating limits;
- notify the purchaser of a facility with vessels safeguarded by OPPSD that the responsibility is not transferable and that the purchaser will have to apply to TSASK to register their own OPPSD program; and
- notify TSASK immediately of an unsafe condition if a pressure vessel with OPPSD exceeds the MAWP.

7. Additional Information & Questions

7.1. Design of Pressure Piping Systems Inquiries

If possible, applicants should contact their Design Reviewer directly with questions. Be sure to include the TSASK reference number or provide enough detail that the Design Reviewer will know which application is being referenced.

For all other design inquiries, please contact TSASK Codes & Standards Compliance:

- By email at CodesandStandards@tsask.ca;
- By phone at either (306) 787-4567 (Regina) or Toll Free (866) 530-8599. Please ask to speak to either a TSASK Design Reviewer or the Manager, Codes & Standards Compliance; or
- Visit the TSASK website at www.tsask.ca for more information