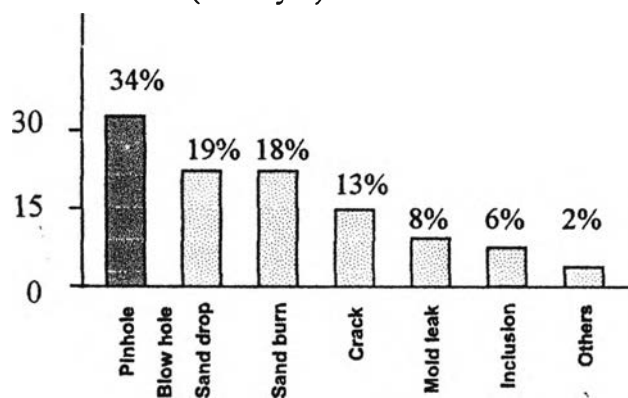


Chapter III

Fundamental Data

The preliminary data were received from two automobile parts foundry factories. This data indicated that the pinhole defect is the most serious problem.

% Of total defect (factory 1).



% Of total defect (factory 2).

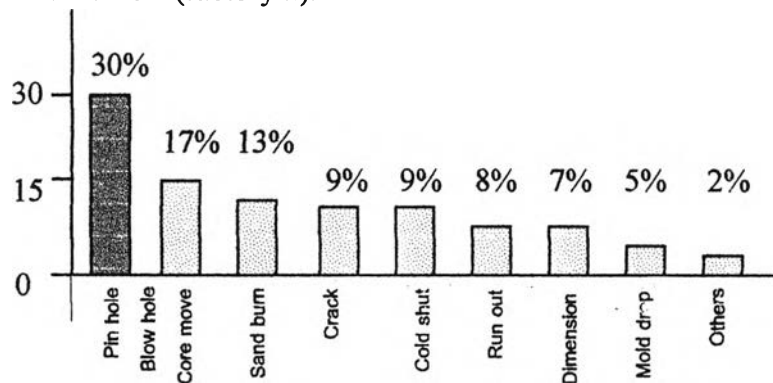


Figure 3-1. Plots of relative amount of casting defects, reported by the sampling factory number 1 (cast iron foundry factory) and factory number 2 (wear and heat resisting steel factory).

In the sampling factories, standard specifications have to be adjusted for the convenience in local environment. The data being analyzed were sand testing report, pouring report and specification data. The results of analysis are shown in Table 3-1 and 3-2. This is used as guidelines of factors setting, according to the specifications that are shown in Table 3-3 and 3-4.

Table 3-1. Data of facing sands, collected from the factory.

Properties	Number of samplings	Unit	Average	Max	Min	Upper control limit	Lower control limit
Moisture	118	%	3.0	3.2	2.8	3.4	2.60
Comp. Str.	101	g/cm ²	575.0	600.0	525.0	644.0	500.0
Permeability	16	-	212.8	275.0	200.0	280.0	156.7

Table 3-2. Data of backing sands, collected from the factory.

Properties	Number of samplings	Unit	Average	Max	Min	Upper control limit	Lower control limit
Moisture	118	%	3.6	3.8	3.4	4.0	3.13
Comp. Str.	101	g/cm ²	1070.0	1100.0	1040.0	1141.0	1000.0
Permeability	17	-	179.4	200.0	150.0	232.6	126.2

Table 3-3. Specifications of chromite sand.

Compositions of chromite sand.		Controlling ranges of specifications	
Chromite sand	94.7 %	Permeability	200-400
Bentonite	4.55 %	Compressive strength	500-600 g/cm ²
Starch	0.76 %	Moisture	2.5-2.7 %

Table 3-4. Specifications of backing sand.

Controlling ranges of specifications	
Permeability	150-250
Compressive strength	1000-1100 g/cm ²
Moisture	3.4-3.8 %

Hypothesis for causes of pinhole and blowhole is shown in Table 3-5, as well as fishbone diagram in Figure 3-2.

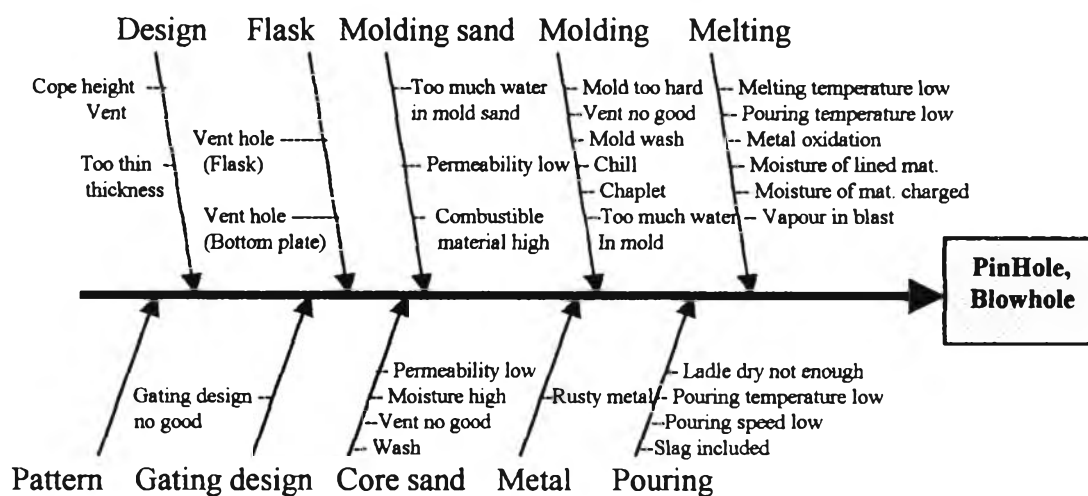
Figure 3-2. Fishbone diagram of pinhole and blowhole ^[14].

Table 3-5. Causes-Effects of some casting defects^[13]

Operating Factor	Defect					
	Blows	Shrinks Cold shut	Misruns	Inclusion	Expansion	Rough Surface
Design	*	*	*	*	*	*
Pattern equipment	-	*	*	-	-	*
Flask equipment and rigging	**	*	*	-	*	*
Gating and risering	*	*	*	**	*	*
Sand	**	-	*	*	**	*
Core	**	-	*	*	*	*
Molding practice	**	-	*	*	*	*
Metal composition	*	*	*	-	-	*
Melting practice	**	*	*	*	-	-
Pouring	**	*	*	*	*	*
Miscellaneous	*	-	*	*	*	-

* Minor cause, ** Major cause

From the preliminary data from the sampling factories, the scope of this work will focus on ranges of specification of sand mixing. The ranges of controlling data in the factory can be compared with the literature survey as follows:

1. Moisture of about 2.5-2.7 %, the control limit of about 2.6 to 3.35 %.
2. Clay content of about 4.55 %; common value mentioned in the literature is 4 to 5 %
3. Starch content of about 0.76 %, common value mentioned in the literature is 0.5 to 1 %