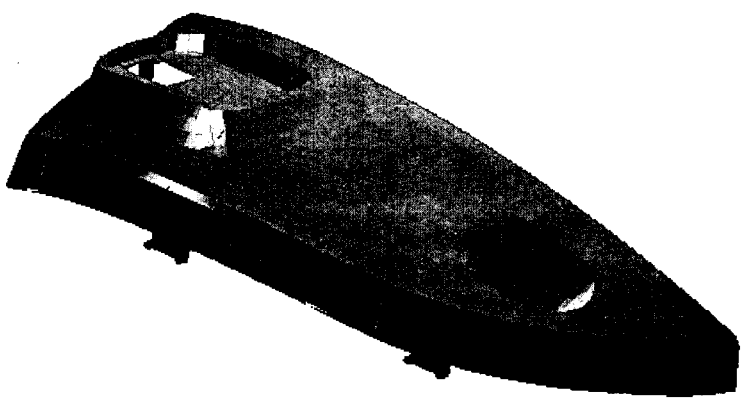
사출성형에서 Cycle Time 감소를 위한 Sprue, Runner 설계 방법의 개선

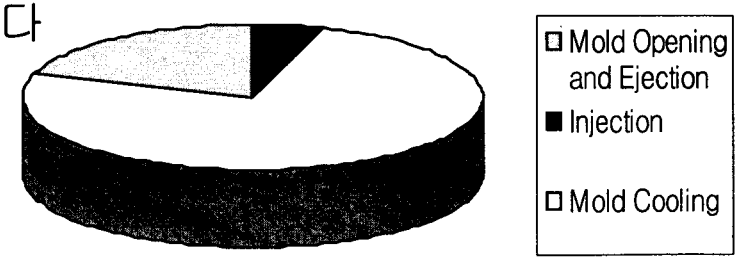


연두희, 노우준

韓國大東電子工業(株) 金型工場

目 的

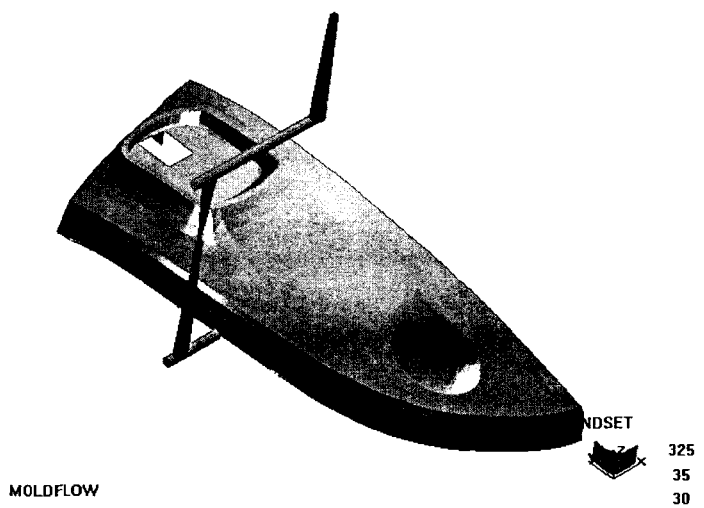
- 사출해석을 통한 Sprue, Runner의 설계 방법 개선
  - Runner의 크기는 경험적으로 크게 만든다
  - 금형 설계 방법의 개선으로 Sprue, runner를 작게 만들 수 있다
  - Sprue, Runner가 작으면 냉각이 빨라 **Cycle Time**을 **단축**할 수 있고, 또한 재료비도 절약할 수 있다



Total Cycle Time

目　次

- 成形性 檢討
  - Runner Diameter
  - 流動(Fill Time)
  - 壓力(Pressure)
  - 溫度(Temperature)
- Cycle time
  - 硬化(Frozen Layer)
  - Cycle time



製品Model

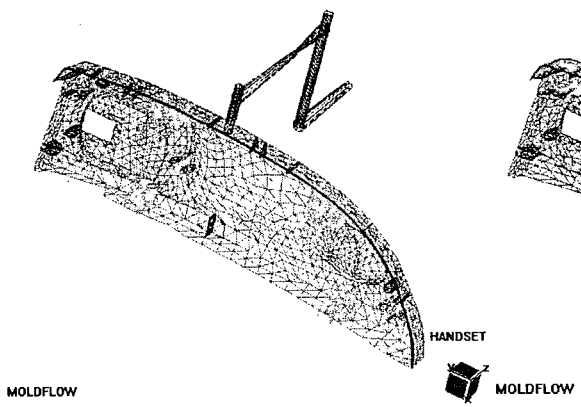
Model Name : Facsimile receiver set

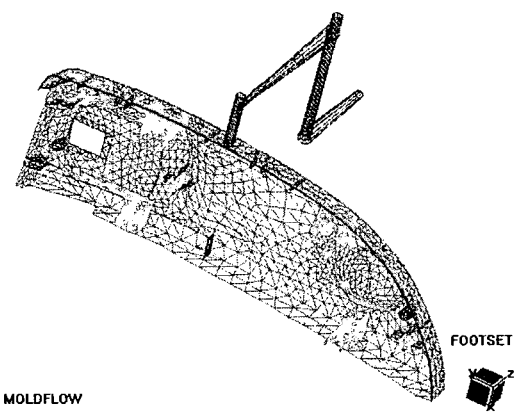
Mesh Element : 3,855

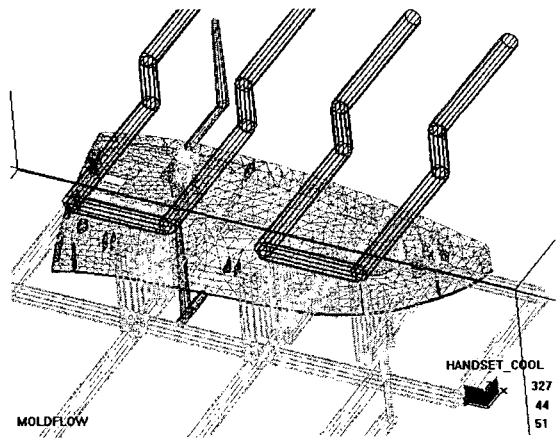
Node : 2,019

Volume : 75.14 cm^3

Resin : PS







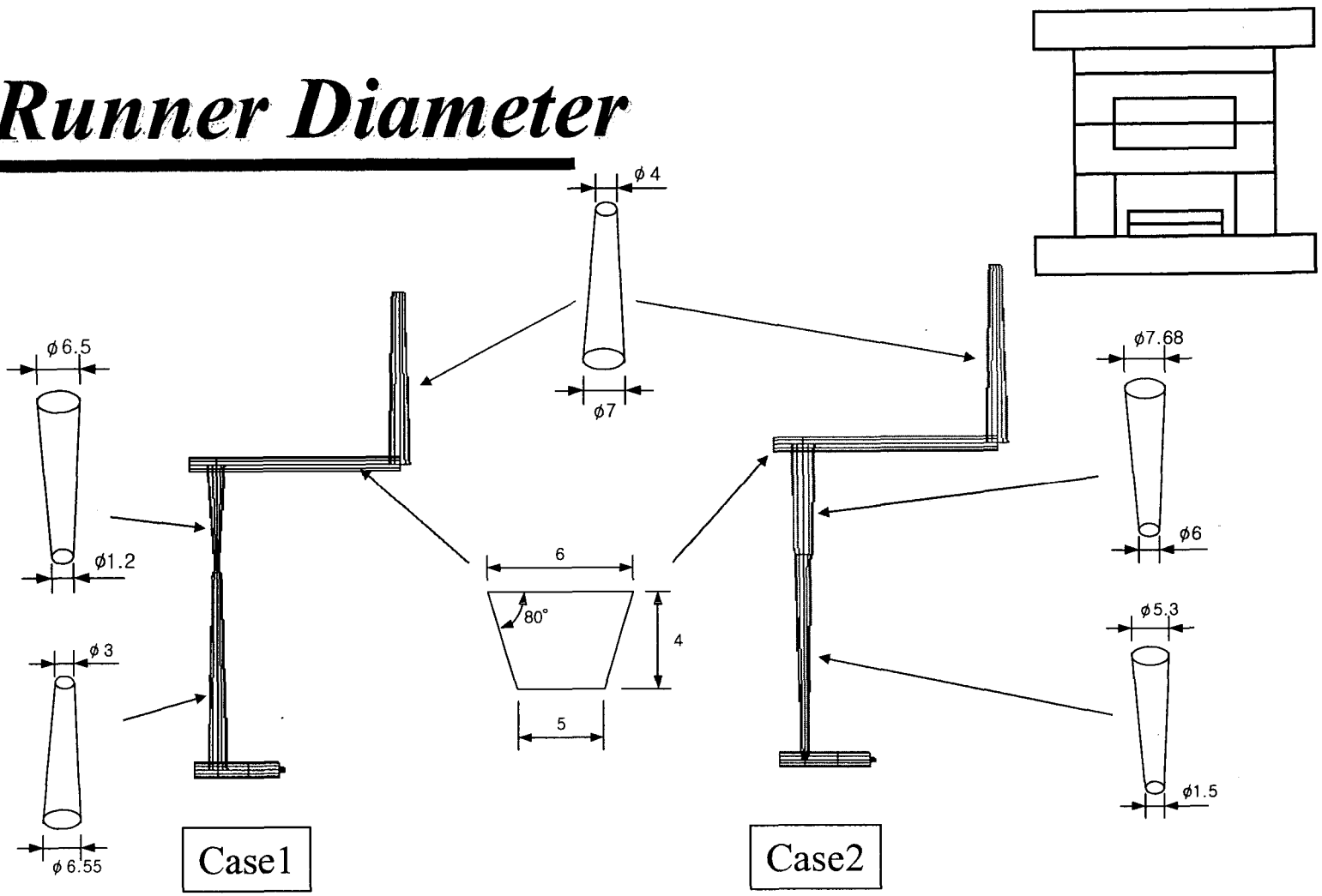
Case1

Case2

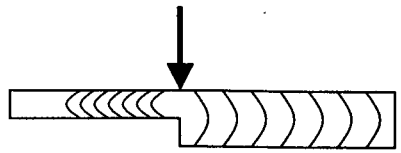
Cool Design

韓國大東電子工業 (株) 金型工場

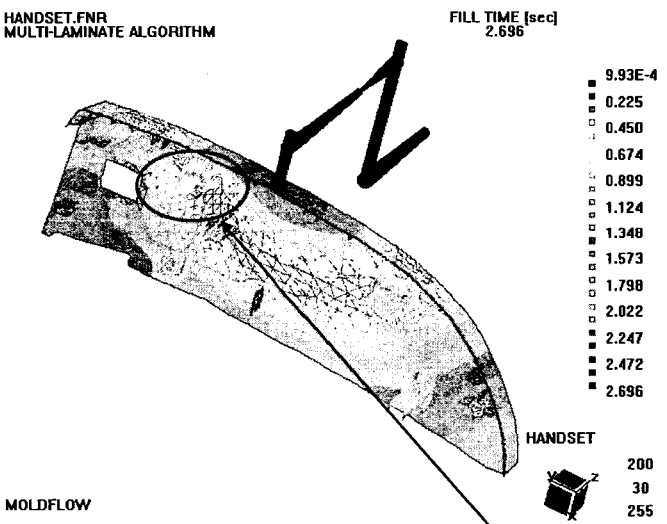
Runner Diameter



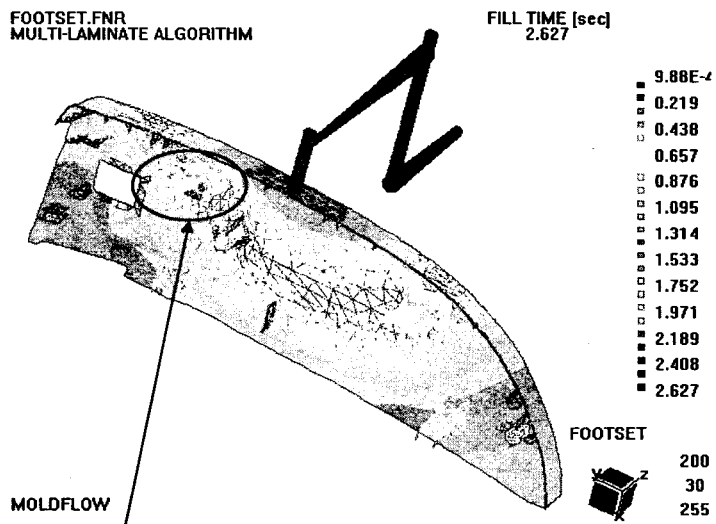
流　動(Fill Time)



Fill time : 2.69 Sec



Fill time : 2.62 Sec



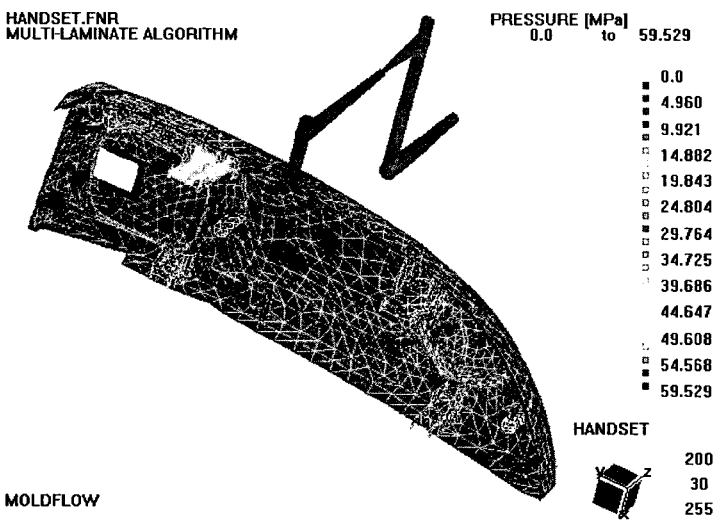
Case1

Rib部分 流動 停滯 注意

Case2

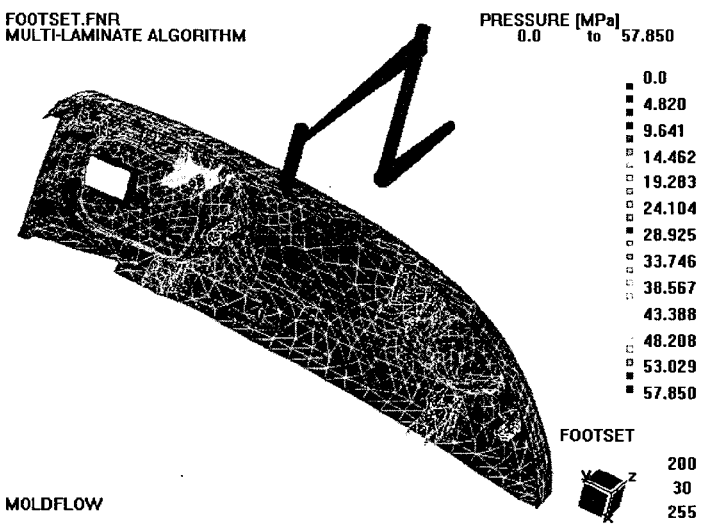
壓　力(Pressure)

Pressure : 59.53 MPa
Clamp Force : 39.41 ton



Case1

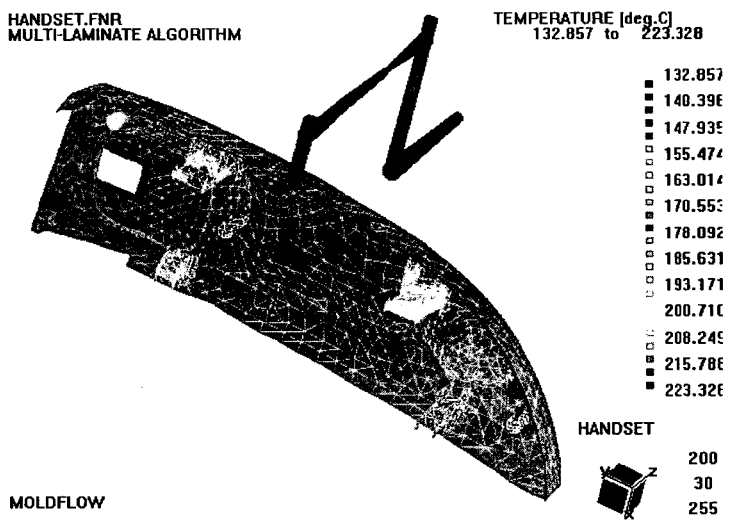
Pressure : 57.85 MPa
Clamp Force : 39.07 ton



Case2

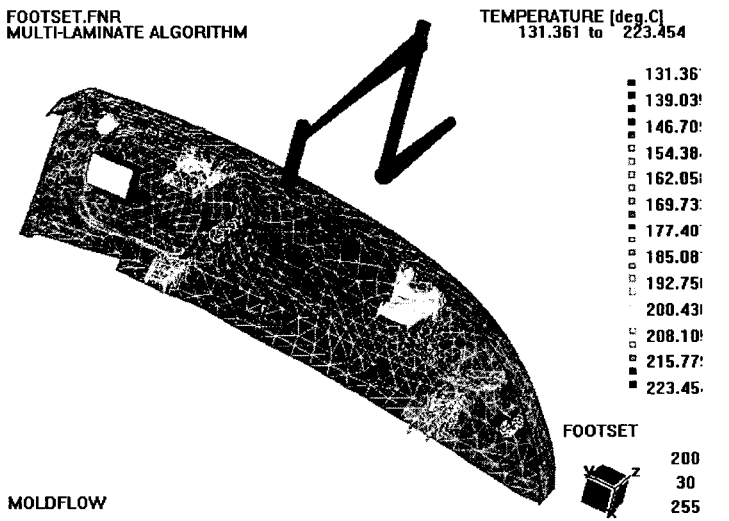
溫　度(Temperature)

Temperature : 132.85 ~ 223.32℃



Case1

Temperature : 131.36 ~ 223.45℃

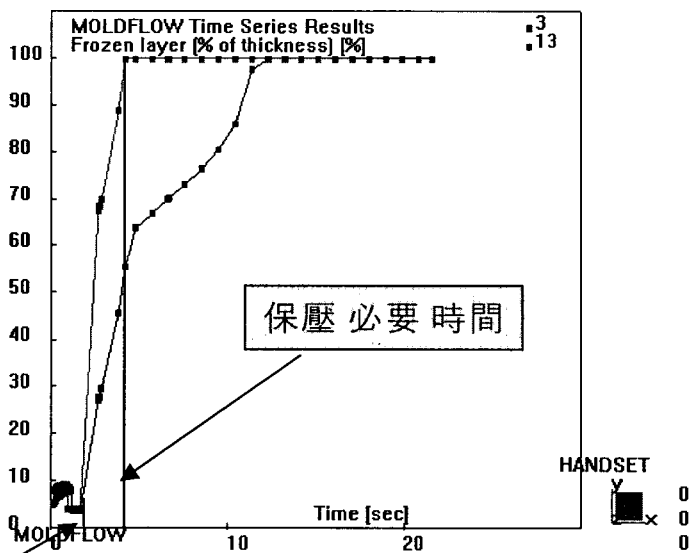


Case2

韓國大東電子工業 (株) 金型工場

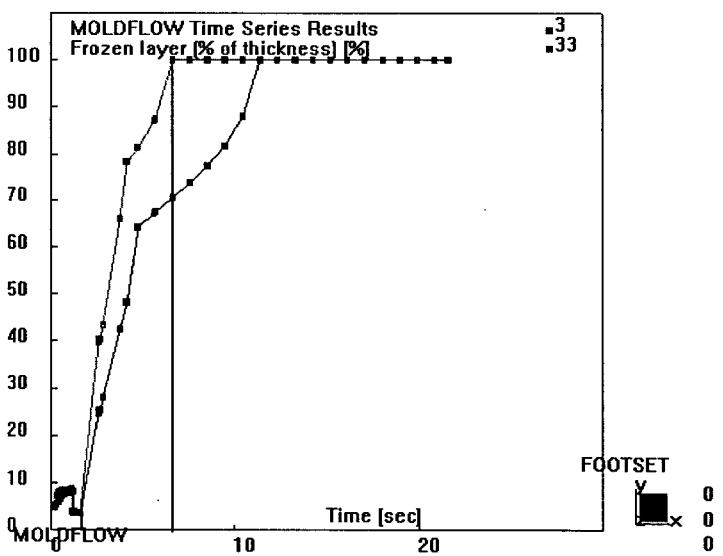
Frozen Layer of Gate

Frozen Layer of Gate : 4.2sec
(Need Time of Hold Pressure : 2.7sec)



Case1

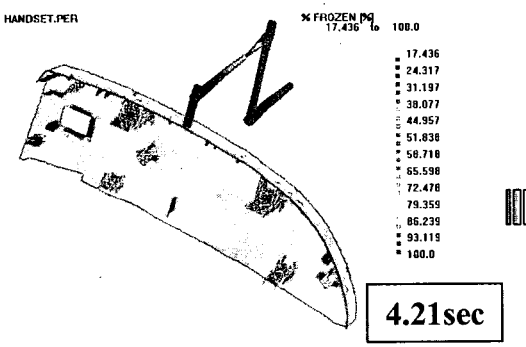
Frozen Layer of Gate : 4.7sec
(Need Time of Hold Pressure : 3.2sec)



Case2

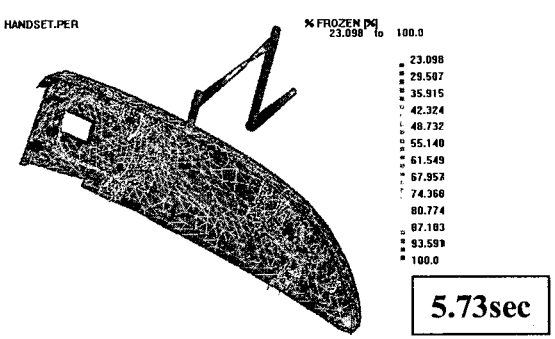
Frozen Layer(Case1)

1.



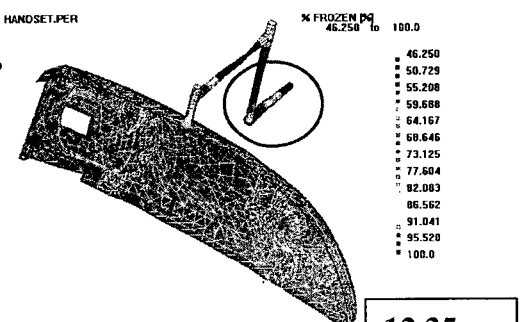
4.21sec

2.



5.73sec

3.

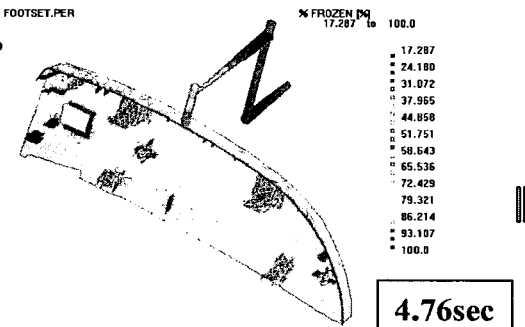


12.35sec

1. Cavity에 樹脂 充塡 直後 硬化率은 50% 정도이다.
2. 5.73sec에 Cavity의 硬化率은 95%,
   Sprue는 35%정도로 取出이 곤란한 상태이다.
3. 12.35sec에 sprue 硬化率이 65%로 取出이 가능하다.

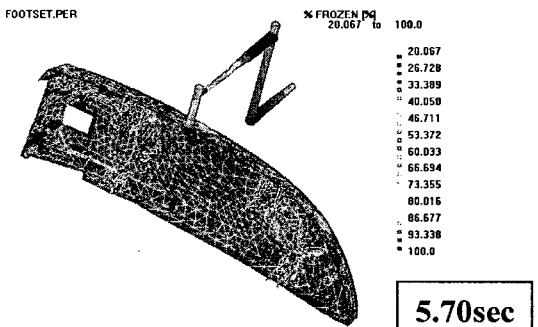
Frozen Layer(Case2)

1.



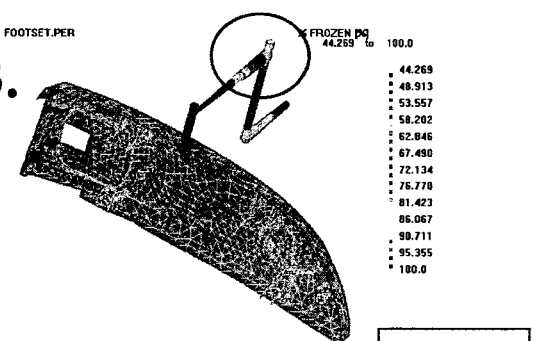
4.76sec

2.



5.70sec

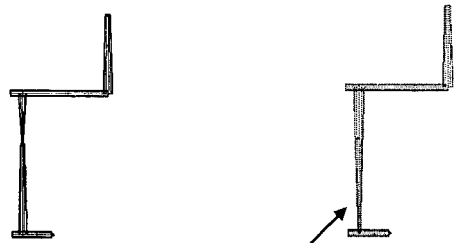
3.



14.26sec

1. Cavity에 樹脂 充塡 直後 硬化率은 50% 정도이다.
2. 5.70sec에 Cavity의 硬化率は 95%,
   Sprue는 35%정도로 取出이 곤란하다.
3. 14.26sec에 runner 硬化率이 65%로 取出이 가능하다.

Cycle Time(Case1,2)

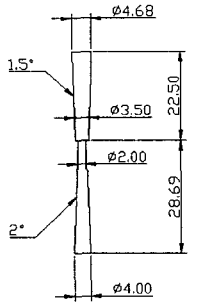


• Cycle Time 條件

單位 : sec

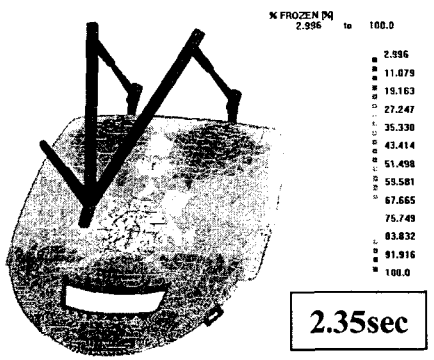
	Case1 2段 Runner	Case2 Straight Runner
充塡 時間	2.6	2.6
保壓 時間	2.7	3.2
冷却 時間	**7.0**	8.4
金型 開閉	10.0 - α	10.0
Cycle Time	**22.3**	24.2

Frozen Layer(Case3)



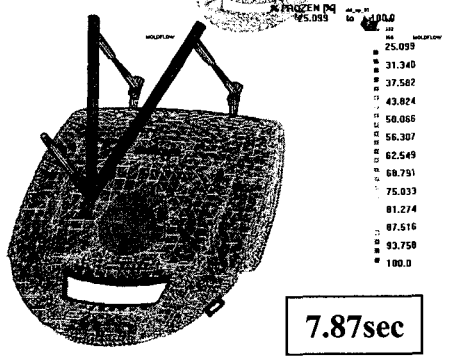
- Other Model : CD player upper case
  - Mesh Element : 5,369
  - Node : 2,849
  - Volume : 42.12 cm^3
  - Resin : PC

1.



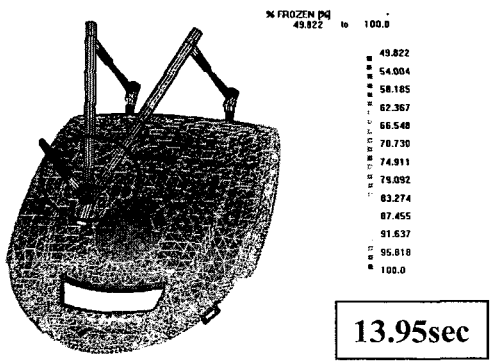
2.35sec

2.



7.87sec

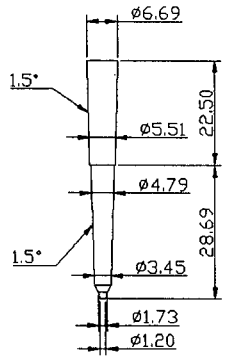
3.



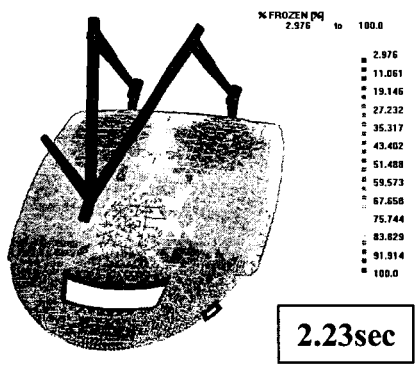
13.95sec

1. Cavity에 樹脂 充塡 直後 硬化率은 50% 정도이다.
2. 7.87sec에 Cavity의 硬化率은 95%,
   Sprue는 35%정도로 取出이 곤란한 상태이다.
3. 13.95sec에 sprue 硬化率이 65%로 取出이 가능하다.

Frozen Layer(Case4)

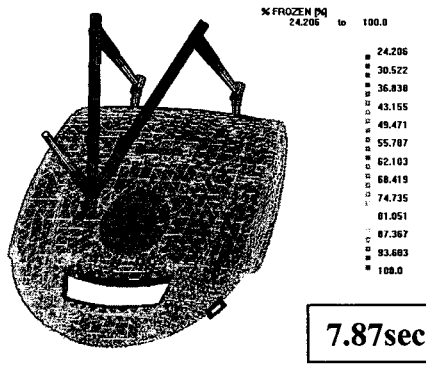


1.



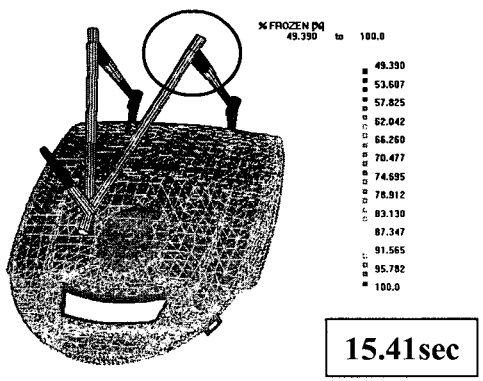
2.23sec

2.



7.87sec

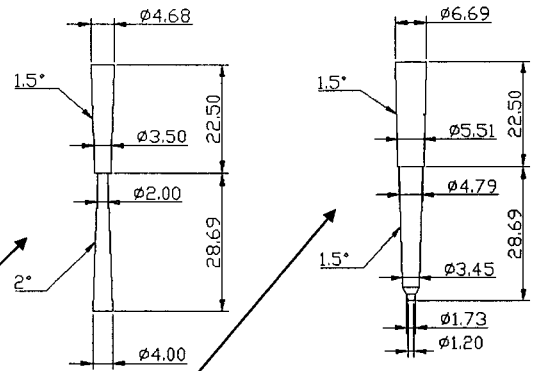
3.



15.41sec

1. Cavity에 樹脂 充塡 直後 硬化率은 50% 정도이다.
2. 7.87sec에 Cavity의 硬化率은 95%,
   Runner는 35%정도로 取出이 곤란한 상태이다.
3. 15.41sec에 runner 硬化率이 65%로 取出이 가능하다.

Cycle Time(Case3,4)



- **Cycle Time 條件**

單位 : sec

	Case3 2段 Runner	**Case4** Straight Runner
充塡 時間	2.4	2.3
保壓 時間	3.1	3.2
冷却 時間	**8.4**	9.9
金型 開閉	10.0 - α	10.0
Cycle Time	**23.9**	25.4

結　論

- 成形性
  - Fill time, Pressure, Temperature
  - 근소한 차이
- Fill time(Case1,2)
  - Rib 部分 流動 停滯 注意
    Gate가까운 곳에 얇은 리브
- **Cycle Time 短縮(Case1, Case3)**
  - **Sub Runner는 2段쪽이 양호**